EVALUATION OF OPEN DUST SOURCES IN THE VICINITY OF BUFFALO, NEW YORK

by

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PREFACE

This Final Report was prepared for the Environmental Protection Agency, Region II, under EPA Contract No. 68-02-2545, Work Assignment No. 1. Mr. Robert Ogg, Air Facilities Branch, was the requestor of this work. This report was prepared by Mr. Russel Bohn, Principal Investigator, with assistance from Dr. Chatten Cowherd, Program Manager.

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1.0 INTRODUCTION

The objective of this study was to determine emission factors for selected open dust sources in the vicinity of Buffalo, New York. The open dust sources of concern included: (a) dust entrainment from paved roadway surfaces, (b) dust entrainment from unpaved roadway surfaces, and (c) dust generation from the handling and storage of stockpile materials.

This study was divided into two phases. Phase I consisted of determining silt and moisture parameters for various roadway and stockpile materials. Phase II incorporated these and other correction parameter data into the predictive emission factor equations previously developed by Midwest Research Institute (MRI) (Table 1). The product of Phase II and the overall program was the development of appropriate fugitive emission factors for selected open dust sources.

The emission factor equations in Table 1 incorporate correction terms to adjust for properties of the material being disturbed, the equipment parameters, and climatic factors. Because the equations are predictive in nature, and account for the important parameters which affect emissions, the equations can be applied to any source condition with proper quantification of the independent variables.

The emission factor equations describe emissions of particles smaller than 30 μm in Stokes diameter, having a particle density of 2 to 2.5 g/cm^3. Particles above this size settle rapidly near the point of emission[1] and are not captured efficiently by the standard high volume particulate sampler,[2,3] EPA's reference device for determination of ambient concentration of total suspended particulates (TSP).

Analysis of parameters affecting the atmospheric transport of fugitive dust indicates that only the portion smaller than 5 μm in size (referred to as fine particles) will be transported over distances greater than a few kilometers from the source.[1] Also, 5 μm is the approximate upper size limit for respirable particulates with which adverse health effects may be associated.[4] Further information pertaining to the development of the emission factor equations can be found in Reference 5.

TABLE 1. NRI EXPERIMENTALLY DETERMINED EMISSION FACTORS FOR OPEN DUST SOURCES[a]

Source category	Measure of extent	Emission factor[b] (lb/unit of source extent)	Reliability[c]	Correction parameters
Unpaved roads	Vehicles miles traveled	$5.9\left(\frac{s}{12}\right)\left(\frac{S}{30}\right)\left(\frac{W}{3}\right)^{0.8}\left(\frac{1}{365}\right)$	A-B	s = Silt content of road surface material, aggregate, or eroding surface (%)
Paved roads	Vehicle miles traveled	$0.45\left(\frac{4}{n}\right)\left(\frac{s}{10}\right)\left(\frac{L}{5,000}\right)\left(\frac{W}{3}\right)^{0.8}$	B-C	S = Average vehicle speed (mph)
Aggregate storage piles	Tons of material put through storage			W = Vehicle weight (tons)
				n = Number of travel lanes
Continuous load-in (e.g., stacker, transfer station)		$0.0018\frac{\left(\frac{s}{5}\right)^{\frac{1}{2}}\left(\frac{U}{5}\right)^{\frac{1}{2}}}{\left(\frac{M}{2}\right)^{\frac{1}{2}}}$	B	L = Surface dust loading on traveled portion of road (lb/mile)
Storage pile maintenance and traffic		$0.10\ K\left(\frac{s}{1.5}\right)\left(\frac{d}{235}\right)$	C	U = Mean wind speed (mph)
Storage pile wind erosion		$0.05\left(\frac{s}{1.5}\right)\left(\frac{d}{235}\right)\left(\frac{f}{15}\right)\left(\frac{D}{90}\right)$	C	M = Unbound moisture content of aggregate (%)
Batch load-out (e.g., front-end loader/truck)		$0.0018\frac{\left(\frac{s}{5}\right)^{\frac{2}{2}}\left(\frac{U}{5}\right)^{\frac{2}{2}}}{\left(\frac{M}{2}\right)^{\frac{2}{2}}\left(\frac{Y}{6}\right)^{\frac{1}{2}}}$	B	Y = Dumping device capacity (yd^3)
				K = Activity factor (= 1 for tested operation)
				d = Number of dry days per year
				f = Percentage of time wind speed exceeds 12 mph
				D = Duration of material in storage (days)

a/ Reference 5.

b/ Annual average emission of dust particles smaller than 30 μm in diameter based on particle density of 2.5 g/cm^3.

c/ A = Excellent; numerous field measurements.
B = Above average; limited number of field measurements.
C = Average; limited data and/or published emission factors where the accuracy is not stated.
D = Below average; engineering estimates made by knowledgeable personnel.
E = Poor; estimated value; assumptions not given.

2.0 PHASE I - SAMPLE COLLECTION AND ANALYSIS

The purpose of the work performed in Phase I was to collect surface material samples from representative open dust sources in the Buffalo, New York, metropolitan area and analyze these samples for silt and moisture content.

Samples of surface material from paved roadways, unpaved roadways, and storage piles were collected in Lackawana, South Buffalo, and Niagara Falls during the period November 1 to 13, 1978. Table 2 identifies the sources, locations, and respective sample numbers for this study.

All samples were transferred to the Erie County Environmental Laboratory for silt and moisture analysis. Moisture content was determined by weight loss on oven drying and silt content was determined by standard dry sieving techniques. The use of the silt content as a measure of the dust generation potential of a material acted on by the forces of wind and/or machinery, extends the applicability of the emission factor formulas to the wide variety of aggregate materials of industrial importance. The upper size limit of silt particles (75 μm in diameter) is the smallest particle size for which size analysis by dry sieving is practical, and this particle size is also a reasonable upper limit for particulates which can become airborne.[5]

Appendix A presents (a) general procedures and data forms for sample collection and (b) detailed procedures and data forms for sample analysis. Additional details about sample collection procedures are presented in subsequent sections of this report. Copies of the actual data forms used in this study are reproduced in Appendix B.

Sampling sites were chosen in the following manner. For the areas of Lackawana, South Buffalo, and Niagara Falls, sites were selected to reflect typical source conditions. The field crew surveyed a number of potential locations and, in many cases, sites suggested by the New York State Department of Environmental Control (NYDEC) personnel were chosen. NYDEC personnel had identified a number of suitable sampling sites prior to MRI's field activity.

TABLE 2. LOCATION OF SAMPLING SITES

Sample No.	Location
	Paved roadways
	Lackawana
1	Across from sewage treatment plant
2	Ingham Street between South and Well
3	Ridge Road at Friendship House
4	Fuhrman between Ridge Road and Route 5[a/]
5	Fuhrman between Ridge Road and Route 5[a/]
	South Buffalo
6	Mystic between Abby and Germania
7	Germania between Mystic and Barraga
9	Hopkins Avenue near Towbridge
10a	Parking Lane Dust--Hopkins Avenue south of Houston
10b	Curb Dust--Hopkins Avenue south of Houston
11	Abby Avenue west of Hopkins
12	Abby Avenue near Republic Steel office building
13	Abby Avenue near Donner Hanna plant gate
16	Abby Avenue extension between South Buffalo Road and gate culvert
	Bethlehem Steel
23	Near blast furnace J
24	South of ship canal
25	West of coal pile
26	Near open hearth No. 1
	Republic Steel
27	Near 18 in. bar mill
28	Access road to blast furnace
	Niagara Falls
31	56th Street near Goodyear plant
33	Girard between 61st Street and 62nd Street

TABLE 2 (CONTINUED)

Sample No.	Location
	Unpaved roadways
	South Buffalo
8	Near Mystic and Germania
14	Barraga Street next to Donner Hanna
15	Track 14 next to Donner Hanna coke ovens
	Republic Steel
30	Slag plant
	Niagara Falls
32	Parking lot--Goodyear plant near 56th Street
34	Parking lot--56th and Buffalo
	Storage piles
	Bethlehem Steel
17	Crushed stone--east storage area
18	Pellets--dead storage
19	Coal--east storage area
20a	Iron ore--Knob Hill storage
20b	Iron ore--Knob Hill storage
21	Pellets--active storage
22	Limestone--active storage
35	Pellets--active storage
36	Iron ore--Knob Hill storage
37	Coal--east storage area
	Republic Steel
29	Pellets--near blast furnace
	Donner Hanna
38	Coke breeze

a/ Sample No. 4 is not representative of the entire roadway. The segment of Fuhrman Avenue sampled consisted of four travel lanes; however, after the sample was collected, two of the travel lanes were found to be inactive. Sample No. 5 was taken from only the two active travel lanes and is considered representative of that location.

For the paved and unpaved roadways, sites were selected based on the type and frequency of vehicular traffic. For paved roads, sites with unusually high surface loadings were not chosen. For unpaved roads, sites with low traffic volumes were not chosen. For storage piles, sites were chosen according to the volume of materials in storage and the potential these materials had for dust emissions.

MRI believes the number of samples collected meets minimum requirements to adequately characterize source conditions in the study areas.

2.1 PAVED ROADWAYS

A total of 22 paved roadway surface samples were collected for the study. The samples were collected to determine silt content and total loading of roadway surface material, correction parameters which are required for input in the appropriate emission factor equation in Table 1.

The samples were collected in the following manner. First, a representative section of the paved roadway was chosen for sample collection. Then a sampling area was determined, usually consisting of a 10-ft lateral width crossing all travel lanes. After collection of the larger particles (stones, etc.) from the sampling area with a whisk broom, the finer particles were collected with a Hoover Model S2015 vacuum cleaner. To provide adequate samples for analysis purposes, a minimum of 60 g of material was usually collected.

The data form used in the collection of the paved roadway samples is presented in Appendix A, Figure A-1. The procedures for determination of total surface loading are presented in Appendix A, Table A-1 and Figure A-2. Silt and moisture analyses procedures are presented in Appendix A, Tables A-2 and A-3, and Figure A-3.

As indicated in Table 1, values for the number of paved roadway travel lanes as well as for the average vehicle weight were also needed. These parameters were determined through MRI field observations. The number of travel lanes were determined visually and average vehicle weights were estimated from the vehicle mix encountered during sampling and from road type (residential, arterial, etc.) based on previous studies by MRI.[5]

Due to time constraints in the field, only two samples were collected in the Niagara Falls area. MRI believes that these samples were representative of arterial roadway conditions. For residential and industrial roadways, it was assumed that Niagara Falls roadways have characteristics similar to those in the other study areas.

2.2 UNPAVED ROADWAYS

A total of six unpaved roadway samples were collected for the study to determine silt content of the roadway surface aggregate, a correction parameter required for input into the appropriate emission factor equation in Table 1.

Samples were collected in the following manner. First, a representative site was chosen. Then a lateral strip approximately 6-in. wide across the travel lanes was swept with a whisk broom. The material collected consisted of the loose surface material lying on top of the hard road base. Collection of at least 50 lb of sample, the quantity recommended for representativeness, often entailed sampling of more than one width across the travel lanes. The total sample was then split, utilizing an ASTM sample splitter, to approximately 1,000 g.

Silt and moisture contents were determined by the methods presented in Appendix A, Tables A-2 and A-3 and Figure A-3. The data form used in the collection of the unpaved roadway samples is presented in Appendix A, Figure A-4.

In addition to the silt content of the unpaved roadway aggregate, information on average vehicle speed and vehicle weight was required. Average vehicle speed was estimated at the time of sample collection and was based on posted speed limits, direct observations, and discussion with plant personnel. Average vehicle weights were estimated by observation of vehicle type and discussions with plant personnel.

2.3 STORAGE PILES

A total of 11 storage pile samples were collected for the study. The samples were collected to determine silt and moisture contents of various aggregate materials. These correction parameters are required for input in the emission factor equations for storage piles in Table 1.

Samples of storage pile materials were collected in the following manner. First, materials were selected which were found in large quantities in the surveyed plants and had an apparent potential for fugitive emissions. Then a sample for a specific pile was taken by compositing a number of incremental samples. Each incremental sample was obtained by removing the upper 2 to 4 in. of material with a shovel. The increments were taken from various areas throughout the surface of the pile to provide a minimum of 50 lb of sample. The sample was then split to approximately 1,000 g for subsequent silt and moisture determinations, as specified in Appendix A, Tables A-2 and A-3 and Figure A-3. The data form used in the collection of the storage pile samples is presented in Figure A-5.

Values for the other correction parameters used to determine storage pile emissions were determined as follows. Climatic values (mean wind speeds, number of dry days per year, and the percentage of time the wind speed exceeds 12 mph) were obtained from the Climatic Atlas.[6] Values related to the type of mechanical activity associated with the storage pile operations (activity factors, duration of material in storage, and dumping device capacity) were obtained from industrial personnel and through field observation by MRI personnel. A further explanation of these correction terms is presented in Reference 5.

3.0 PHASE II - EMISSION FACTOR DETERMINATION

The objective of Phase II of the study was to determine emission factors for the specific fugitive dust sources identified in Phase I. The emission factors were determined by utilizing the appropriate correction parameter values obtained in Phase I and substituting these values into the emission factor equations in Table 1.

For each of the source categories, two emission factors were calculated. Suspended particulate emissions include all particles smaller than 30 μm in Stokes diameter, based on a particle density of 2.5 g/cm^3. Particulates of this size range are such that they may be captured by a High Volume Air Sampler.[2,3] Fine particulate emissions include all particles smaller than 5 μm in Stokes diameter based on a particle density of 2.5 g/cm^3. It is possible for particles of this size range to be captured by the human respiratory system. Also, fine particles have the potential for dispersion on a regional scale.

3.1 PAVED ROADWAYS

The correction parameter values and the resultant emission factors determined for paved roadways are presented in Table 3. Average paved roadway emission factors based on roadway type are presented in Table 4.

MRI source testing of dust reentrainment from industrial paved roads has shown that the paved roadway equation in Table 1 under-predicts industrial roadway emissions by a factor of approximately 3.[7] This under-prediction of the true emission value is not explained by the correction factors in the emission factor equation. MRI believes the increased emissions are due to vehicles driving upon unpaved road shoulders, or the direct release of dust from the underbodies of vehicles. Because of the complexity of quantifying the causes of increased emissions from industrial roadways vs urban roadways, MRI has chosen to multiply the industrial roadway emission factors determined from the predictive equation by a factor of 3. This will enable the predictive equation to approach the actual emission factor for industrial roadways.

In MRI's opinion, the emission factor values for Sample Nos. 13 and 16 are atypically high. Maximum emissions from heavy trucks using unpaved roads rarely approach 30 lb/VMT. The high total loading values obtained from these

TABLE 3. PAVED ROADWAY EMISSION FACTORS

Location	Sample No.	Road type	Number of travel lanes	Silt content (%)	Total loading (lb/mile)	Vehicle weight (tons)[a]	Particulate emission factor (lb/VMT)[b] Suspended[c]	Fine[d]
Lackawanna								
Across from sewage plant	1	Residential	2	10.9	256	3	0.050	0.025
Ingham between South and Mill	2	Residential	2	12.6	158	3	0.081	0.041
Ridge Road at Friendship House	3	Commercial	2	9.6	74	3	0.013	0.007
Fuhrman between Ridge Road and Route 5	4	Arterial	4	24.3	303	7	0.13	0.066
As above	5	Arterial	4	2.5	76	7	0.003	0.0015
South Buffalo								
Mystic between Abby and Germania	6	Residential	2	15.3	164	7	0.089	0.045
Germania between Mystic and Barraga	7	Residential	2	40.3	191	3	0.14	0.070
Hopkins near Towbridge	9	Arterial	2	32.9	12	7	0.014	0.007
Hopkins--parking area dust	10a	Arterial	1	7.6	4,171	3	1.14	0.57
Hopkins--curb dust	10b	Arterial	1	8.6	6,568	3	2.03	1.01
Abby Avenue west of Hopkins	11	Residential	2	12.8	164	10	0.099	0.050
Abby near Republic Steel office bldg.	12	Industrial	1	8.0	426	10	0.96	0.48
Abby near Donner Hanna plant gate	13	Industrial	2	8.4	20,698	10	25[e]	12[e]
Abby Avenue extension	16	Industrial	1	4.8	45,936	15	86[e]	43[e]
Bethlehem Steel								
Near blast furnace J	23	Industrial	2	5.5	582	10	0.45	0.23
South of slip canal	24	Industrial	2	6.6	1,479	10	1.4	0.70
West of active coal pile	25	Industrial	2	1.6	499	15	0.33	0.17
Near open hearth No. 1	26	Industrial	2	8.9	65	10	0.081	0.041
Republic Steel								
Near 18 in. bar mill	27	Industrial	2	1.9	1,150	10	0.30	0.15
Access road to blast furnace	28	Industrial	2	1.1	16,896	10	2.6	1.3
Niagara Falls								
56th Street near Goodyear plant	31	Arterial	4	33.0	75	3	0.022	0.011
Girard between 61st and 62nd Streets	31	Arterial	3	21.4	48	3	0.012	0.006

a/ Weights based on field estimations by MRI and discussions with plant personnel.
b/ VMT = Vehicle miles traveled.
c/ Suspended particulate emissions include all particles smaller than 30 μm in Stokes diameter based on a particle density of 2.5 g/cm^3.
d/ Fine particulate emissions include all particles smaller than 5 μm in Stokes diameter based on a particle density of 2.5 g/cm^3.
e/ Values considered to be atypical.

TABLE 4. AVERAGE PAVED ROADWAY EMISSION FACTORS BY ROAD TYPE

Road type	Emission factors (lb/VMT) Suspended particulate[a]	Fine particulate[b]
Residential	0.092	0.046
Commercial	0.013	0.007
Arterial[c]	0.013	0.007
Industrial[d]	0.87	0.43

a/ Includes all particles smaller than 30 μm in Stokes diameter based on a particle density of 2.5 g/cm^3.

b/ Includes all particles smaller than 5 μm in Stokes diameter based on a particle density of 2.5 g/cm^3.

c/ Samples 4, 10a, and 10b were not used in averages.

d/ Samples 13 and 16 were not used in averages.

samples reflect truck spills of aggregate onto the roadway and are not representative of industrial roadways.

In computing the average emission factors presented in Table 4 for arterial roads, Sample Nos. 4, 10a, and 10b were excluded. In the case of Sample No. 4, two of the four travel lanes on the segment of Fuhrman Avenue sampled were later found to be inactive. Sample Nos. 10a and 10b consisted of parking lane dust (rather than dust from active travel lanes), obtained to show the variation in dust loading across the roadway.

Sample Nos. 13 and 16 were excluded from the averages in Table 4 for industrial roads for the reasons explained above. Sample No. 12 is considered typical for the Donner Hanna area.

3.2 UNPAVED ROADWAYS

The required correction parameters and the resultant emission factors for the unpaved roadways are presented in Table 5. Average unpaved roadway emission factors based on road type are presented in Table 6.

3.3 STORAGE PILES

The required input correction parameter values used in the determination of storage pile-related emissions are presented in Table 7. Emission factors for storage pile load-in, vehicular traffic, wind erosion, and load-out activities as well as emission factors for the total storage cycle are presented in Table 8. Average emission factors based on material type are presented in Table 9.

Except for emissions from dead storage piles, all emissions were determined according to the equations presented in Table 1. Only emissions from wind erosion were determined for dead storage piles since this is generally the only emission activity associated with dead storage.

To account for the weather-crusted surfaces of dead piles, which tend to impede wind erosion, a control efficiency of 80% was applied to these emission factors. This control efficiency value was not measured directly; however, preliminary wind erosion testing by MRI using a portable wind tunnel placed over the storage material indicated that surface crusting of dormant storage piles greatly impedes wind erosion.[7] Also, during the field collection of storage pile samples, a rigid surface crust was found on all dead storage piles. MRI has assumed that this crust reduces wind erosion by approximately 80%.

TABLE 5. UNPAVED ROADWAY EMISSION FACTORS

Location	Sample No.	Land use	Silt content (%)	Vehicle speed (mph)	Vehicle weight (tons)[a]	Dry days per year (days)[b]	Particulate emission factors (lb/VMT) Suspended[c]	Fine[d]
South Buffalo								
Near Mystic and Germania	8	Industrial	4.5	20	12	215	2.6	1.0
Barraga Street next to Donner Hanna	14	Industrial	3.6	25	15	215	3.1	1.2
Truck 14 next to Donner Hanna coke ovens	15	Industrial	4.3	20	25	215	4.5	1.8
Republic Steel								
Slag plant road	30	Industrial	7.1	20	30	215	8.6	3.4
Niagara Falls								
Goodyear plant near 56th Street	32	Commercial (parking lot)	8.4	10	3	215	0.81	0.32
56th and Buffalo	34	Commercial (parking lot)	8.2	10	15	215	2.9	1.2

a/ Weights based on field estimations by MRI and discussions with plant personnel.
b/ Obtained from Climatic Atlas[6].
c/ Suspended particulate emissions include all particles smaller than 30 μm in Stokes diameter based on a particle density of 2.5 g/cm^3.
d/ Fine particulate emissions include all particles smaller than 5 μm in Stokes diameter and based on a particle density of 2.5 g/cm^3.

TABLE 6. AVERAGE UNPAVED ROADWAY EMISSION FACTORS BY ROAD TYPE

Road type	Emission factors (lb/VMT) Suspended[a] Particulates	Fine[b] Particulates
Industrial	4.7	1.9
Commercial (parking lot)	1.9	0.76

a/ Includes all particles smaller than 30 μm in Stokes diameter based on a particle density of 2.5 g/cm^3.

b/ Includes all particles smaller than 5 μm in Stokes diameter based on a particle density of 2.5 g/cm^3.

TABLE 7. STORAGE PILE CORRECTION PARAMETERS[a]

Sample No.	Material in storage	Silt content (%)	Moisture content[b]	Mean wind speed[c] (mph)	Percentage wind speed > 12 mph[c] (%)	Dry days per year[c] (days)	Duration of storage (days)[d]	Effective loader capacity (yd^3)		Activity factor[e]				Material handling equipment types	
								L.I.	L.O.	L.I.	T.	W.E.	L.O.	L.I.	L.O.
Bethlehem Steel															
17	Crushed stone	5.5	2.2	12.4	37	215	180	-	-	0	0	1.0	0	Dead storage	
18	Pellets	3.5	1.7	12.4	37	215	180	-	-	0	0	1.0	0	Dead storage	
19	Coal	7.7	1.8	12.4	37	215	90	-	-	1.0	0.5	1.0	[f]	Stacker, scraper	
20a	Knob Hill ore	3.8	6.7	12.4	37	215	90	10	10	1.0	0	1.0	1.0	Clamshell bucket	
20b	Knob Hill ore	4.0	8.1	12.4	37	215	90	10	10	1.0	0	1.0	1.0	Clamshell bucket	
21	Pellets	6.8	2.1	12.4	37	215	90	10	10	1.0	0	1.0	1.0	Clamshell bucket	
22	Limestone	0.4	[g]	12.4	37	215	90	10	10	1.0	0	1.0	1.0	Clamshell bucket	
35	Pellets	5.9	2.0	12.4	37	215	90	10	10	1.0	0	1.0	1.0	Clamshell bucket	
36	Knob Hill ore	5.7	7.0	12.4	37	215	90	10	10	1.0	0	1.0	1.0	Clamshell bucket	
37	Coal	3.8	3.3	12.4	37	215	180	-	-	1.0	0.5	1.0	[f]	Stacker, scraper	
Republic Steel															
29	Pellets	1.0	0.9	12.4	37	215	90	9	9	1.0	0	1.0	1.0	Clamshell bucket	
Donner Hanna															
38	Coke breeze	5.4	6.4	12.4	37	215	180	-	-	0	0	1.0	0	Dead storage	

[a] L.I. = load-in, T. = traffic, W.E. = wind erosion, L.O. = load-out.

[b] All moisture and silt values are based on samples taken from the surface of the storage piles.

[c] Obtained from Climatic Atlas.[b]

[d] Obtained from plant personnel.

[e] Assumed value by MRI based on relative material handling activity.

[f] Activity factor = 0; load-out emissions are included as part of the traffic emissions due to the scraper activity.

[g] Value not obtained; assume 1.0% moisture.

TABLE 8. STORAGE PILE EMISSION FACTORS

Sample No.	Material in storage	Emission factors (suspended/fine)[a] Load-in (lb/ton)	Vehicular traffic (lb/ton)	Wind erosion[b] (lb/ton)	Load-out (lb/ton)	Total storage cycle (lb/ton stored)
Bethlehem Steel						
17	Crushed stone--dead storage	0/0	0/0	0.2/0.06	0/0	0.2/0.06
18	Pellets--dead storage	0/0	0/0	0.1/0.03	0/0	0.1/0.03
19	Coal--active storage	0.002/0.0006	0.2/0.07	0.6/0.2	0/0	0.8/0.3
20a	Knob Hill ore--active storage	0.0002/0.00006	0/0	0.3/0.09	0.0002/0.00006	0.3/0.09
20b	Knob Hill ore--active storage	0.0001/0.00003	0/0	0.3/0.09	0.0001/0.00003	0.3/0.09
21	Pellets--active storage	0.003/0.0009	0/0	0.5/0.15	0.003/0.0009	0.5/0.2
22	Limestone--active storage	0.0009/0.0003	0/0	0.03/0.009	0.0009/0.0003	0.03/0.01
35	Pellets--active storage	0.003/0.0009	0/0	0.4/0.13	0.003/0.0009	0.4/0.1
36	Knob Hill ore--active storage	0.0002/0.00006	0/0	0.4/0.13	0.0002/0.00006	0.4/0.1
37	Coal--active storage	0.001/0.0003	0.1/0.03	0.6/0.2	0/0	0.7/0.2
Republic Steel						
29	Pellets--active storage	0.008/0.002	0/0	0.2/0.07	0.008/0.002	0.2/0.07
Donner Hanna						
38	Coke breeze--dead storage	0/0	0/0	0.2/0.06	0/0	0.2/0.06

a/ Suspended particulate emissions include all particles smaller than 30 μm in Stokes diameter. Fine particulate emissions includes all particles smaller than 5 μm in Stokes diameter. All particles are assumed to have a particle density of 2.5 g/cm^3.

b/ An assumed 80% control efficiency was applied to the dead storage piles to account for the crusted surfaces of these piles.

TABLE 9. AVERAGE EMISSION FACTORS BY MATERIAL TYPE

Active storage	Total storage cycle emission factors[a] Suspended Particulates	Fine Particulates
Coal	0.8	0.3
Pellets	0.4	0.1
Knob Hill ore	0.3	0.1
Limestone	0.03	0.01
Dead storage		
Crushed stone	0.2	0.06
Pellets	0.1	0.03
Coke breeze	0.2	0.06

a/ Suspended particulate emissions include all particles smaller than 30 μm in Stokes diameter based on a particle density of 2.5 g/cm^3. Fine particulate emissions include all particles smaller than 5 μm in Stokes diameter.

3.4 EMISSION FACTOR RELIABILITY

A relative reliability rating for these emission factors is presented in Table 1. Based on MRI's work in developing the emission factors, the following bounds of confidence are generally associated with them: (a) paved roadway factors are accurate to within a factor of 2; (b) unpaved roadways are accurate to within a factor of ±50%; and (c) storage pile activities are accurate to within a factor of 3. Further information pertaining to the relative ratings of the emission factor equations is contained in Reference 5.

3.5 APPLICATION OF EMISSION FACTORS FOR INVENTORY PURPOSES

The emission factors for open dust sources determined in this report are presented in a manner suitable for use in air pollution emission inventories. Information pertaining to the measures of source extent associated with the emission factors (vehicle miles traveled and tons of material throughput) are available from state or local planning agencies or industrial plants.

The emission factors are expressed on an average annual basis. Thus, care should be taken when applying these factors to specific time periods.

The emission factors are presented in two particle size formats which enables the determination of particulate source impact on a micro- and mesoscale area. Suspended particulate emissions (particles $< 30\ \mu m$) should be used to evaluate the impact of fugitive dust sources within an area of approximately 100 to 200 m of a source. Fine particulate emissions (particles $< 5\ \mu m$) should be used to evaluate the impact of fugitive dust sources within an area of approximately 5 to 10 Km.[1/]

Information pertaining to emissions data for other fugitive dust sources may be found in Reference 5. From this reference, data for plants B and D may be used to approximate emissions for the steel industry in the Buffalo area. These two plants are located in areas with climates somewhat similar to the Buffalo area.

REFERENCES

1. Cowherd, C. C., Jr., C. M. (Guenther) Maxwell. Development of a Methodology and Emission Inventory for the Regional Air Pollution Study. EPA-450/3-76-003, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, January, 1976. p. 72.

2. Cowherd, C. C., Jr., K. Axetell, Jr., C. M. (Guenther) Maxwell, and G. Jutze. Development of Emission Factors for Fugitive Dust Sources. EPA-450/3-74-037, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1974. p. 39.

3. Miller, S. S. Inhaled Particulates. Environmental Sciences and Technology, 12(13):1354, December, 1978.

4. Shannon, L. J., P. G. Gorman, and W. Park. Feasibility of Emissions Standards Based on Particle Size. EPA 600-3-74-007, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, March, 1974. 221 pp.

5. Bohn, R., T. Cuscino, Jr., and C. C. Cowherd, Jr. Fugitive Emissions from Integrated Iron and Steel Plants. EPA 600/2-78-050, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1978. pp. 3-1 to 4-36.

6. U.S. Department of Commerce. Climatic Atlas of the United States. Environmental Sciences Services Administration, Environmental Data Service, 1968. 80 pp.

7. Midwest Research Institute. Iron and Steel Plant Open Source Fugitive Emission Evaluation - Draft Final Report (in preparation). Contract No. 68-02-2609, Task 3, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, February, 1979.

APPENDIX A

SAMPLE COLLECTION AND ANALYSIS PROCEDURES

MIDWEST RESEARCH INSTITUTE

MRI Project No. _____ | Sampling Data Paved Roads | Date _____ Recorded by _____

Type of Material Sampled: _____

Site of Sampling: _____

Type of Pavement: _____ Surface Condition _____

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

Indicate deviations from above method: _____

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM

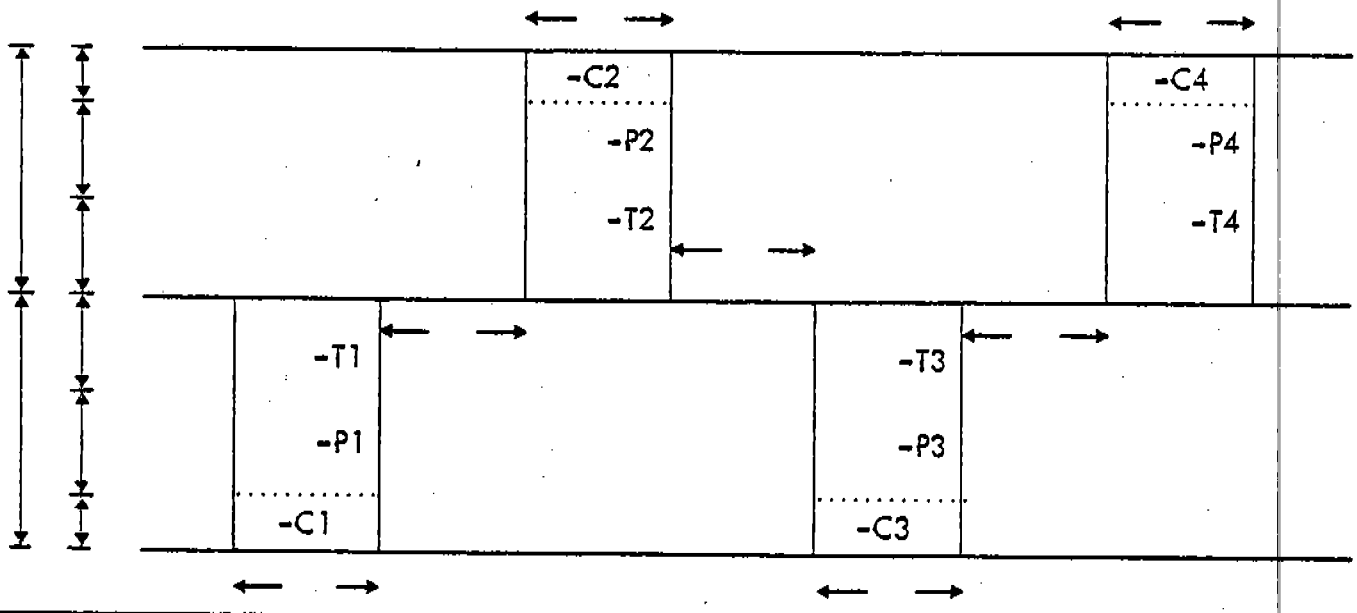

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Figure A-1. Sampling data form - paved roads.

TABLE A-1. PROCEDURE FOR DETERMINATION OF PAVED ROADWAY SURFACE LOADING

1. Sample the paved roadway according to the data form entitled, "Sampling Data Paved Roads" (see previous page).

2. After the sampling period, label and seal all sample containers.

3. Weigh each sample increment and record total weight values for each roadway segment according to the following procedure:

A. Weight of hand sweepings (Bag + sample)

B. Tare weight of bag used in step A.

C. Record A minus B.

D. Weight of vacuum bag plus sample

E. Tare weight of vacuum bag

F. Record D minus E.

G. Carefully empty the vacuum bag by cutting folded areas to remove all sample and place the contents in with the hand sweepings (step A). If no hand sweepings were collected, place contents in a container for subsequent sieve analysis. Step G consists of the weight of the empty/out vacuum bag.

H. Record G minus E. This is the mass of material left in the emptied vacuum bag.

I. Total mass available for sieve analysis

$$I = C + D - G$$

J. Total mass collected during field collection

$$J = C + F$$

This value is used to determine roadway mass surface loading.

Note: Steps I and J vary only by the amount of material remaining in the empty vacuum bag.

Sample Location	A Hand Sweepings (Bag + Sample)	B Bag Tare Weight	C (A-B)	D Vacuum Bag + Sample	E Tare Weight of Vacuum Bag	F (D-E)	G Empty Vacuum Bag Weight	H (G-E)	I I=C+D-G	J J=C+F
Walnut Ave.	969.6 g	18.5	951.1	112.9	13.9	99.0	16.0	2.1	1,048.0	1,050.1 g

Figure A-2. Example paved roadway calculation procedure.

TABLE A-2. SILT ANALYSIS PROCEDURES

1. Select the appropriate 8-in. diameter, 2-in. deep sieve sizes. Recommended U.S. Standard Series sizes are: 3/8 in., No. 4, No. 20, No. 40, No. 100, No. 140, No. 200, and a pan. Comparable Tyler Series sizes can also be utilized. The No. 20 and the No. 200 are mandatory. The others can be varied if the recommended sieves are not available or if buildup on one particular sieve during sieving indicates that an intermediate sieve should be inserted.

2. Obtain a mechanical sieving device such as a vibratory shaker or a Roto-Tap.

3. Clean the sieves with compressed air and/or a soft brush. Material lodged in the sieve openings or adhering to the sides of the sieve should be removed (as possible) without handling the screen roughly.

4. Attain a scale (capacity of at least 1,600 g) and record make, capacity, smallest division, date of last calibration, and accuracy (if available).

5. Tare sieves and pan. Check the zero before every weighing. Record weights.

6. After nesting the sieves in decreasing order with pan at the bottom, dump dried laboratory sample (probably immediately after moisture analysis) into the top sieve. Brush fine material adhering to the sides of the container into the top sieve and cover the top sieve with a special lid normally purchased with the pan.

7. Place nested sieves into the mechanical device and sieve for 20 min. Remove pan containing minus No. 200 and weigh. Replace pan beneath the sieves and sieve for another 10 min. Remove pan and weigh. When the difference between two successive pan sample weighings (where the tare of the pan has been subtracted) is less than 3.0%, the sieving is complete.

8. Weigh each sieve and its contents and record the weight. Check the zero before every weighing.

9. Collect the laboratory sample and place the sample in a separate container if further analysis is expected.

TABLE A-3. MOISTURE ANALYSIS PROCEDURES

1. Preheat the oven to approximately 110°C (230°F). Record oven temperature.

2. Tare the laboratory sample containers which will be placed in the oven. Tare the containers with the lids on if they have lids. Record the tare weight(s). Check zero before weighing.

3. Record the make, capacity, smallest division, and accuracy (if displayed) of the scale.

4. Weigh the laboratory sample in the container(s). Record the combined weight(s). Check zero before weighing.

5. Place sample in oven and dry overnight.[a/]

6. Remove sample container from oven and (a) weigh immediately if uncovered, being careful of the hot container; or (b) place tight-fitting lid on the container and let cool before weighing. Record the combined sample and container weight(s). Check zero before weighing.

7. Calculate the moisture as the initial weight of the sample and container minus the oven-dried weight of the sample and container divided by the initial weight of the sample alone. Record the value.

8. Calculate the sample weight as the oven-dried weight of the sample and container minus the weight of the container. Record the value.

a/ Dry materials composed of hydrated minerals or organic materials like coal and certain soils for only 1-1/2 hr.

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. _____

Recorded by _____

Material: _____

Sample No: _____

Total Sample Weight: _____
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$$\frac{C \times 100}{A} = \_\_\_\_\_ \% \text{ Moisture}$$

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start:	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
0.375 in.				
4 mesh				
20 mesh				
40 mesh				
100 mesh				
140 mesh				
200 mesh				
Pan				

Net Weight < 20 mesh: _____
Net Weight < 200 mesh: _____

$$\% \text{ Silt:} = \frac{\text{Net Weight} < 200 \text{ Mesh}}{\text{Total Net Weight}} \times 100 = \_\_\_\_\_ \times 100 = \_\_\_\_ \%$$

*Indicate Units with all Weights

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Figure A-3. Silt and moisture analysis data form.

MIDWEST RESEARCH INSTITUTE

MRI Project No. _____

Sampling Data
Unpaved Roads

Date _____
Recorded by _____

Type of Material Sampled: _____

Site of Sampling: _____

SAMPLING METHOD

1. Sampling device: whisk broom and dust pan
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every 10 miles sampled
   (b) composite of 4 increments: lateral strips of 6" width extending over traveled portion of roadway half

Indicate deviations from above method: _____

SAMPLING DATA

Sample No.	Time	Location	Surface Area	Depth	Quantity of Sample

DIAGRAM

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Figure A-4. Sampling data form - unpaved roads.

MIDWEST RESEARCH INSTITUTE

MRI Project No. _____

Sampling Data
Storage Piles

Date _____
Recorded by _____

Type of Material Sampled: _____

Site of Sampling: _____

SAMPLING METHOD

1. Sampling device: pointed shovel
2. Sampling depth: 4 - 6 inches
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every pile sampled
   (b) composite of 10 increments
5. Minimum portion of stored material (at one site) to be sampled: 25%

Indicate deviations from above method: _____

SAMPLING DATA

Sample No.	Time	Location (Refer to map)	Surface Area	Depth	Quantity of Sample

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Figure A-5. Sampling data form - storage piles.

APPENDIX B

FIELD DATA FORMS FOR SILT/MOISTURE ANALYSIS

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332 L-1

Sampling Data
Paved Roads

Date 1/2/78
Recorded by RB

Type of Material Sampled: Roadway Dust
Site of Sampling: Across From Lackawanna Sewage Treatment Plant
Type of Pavement: Asphalt Surface Condition Some Cracks

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

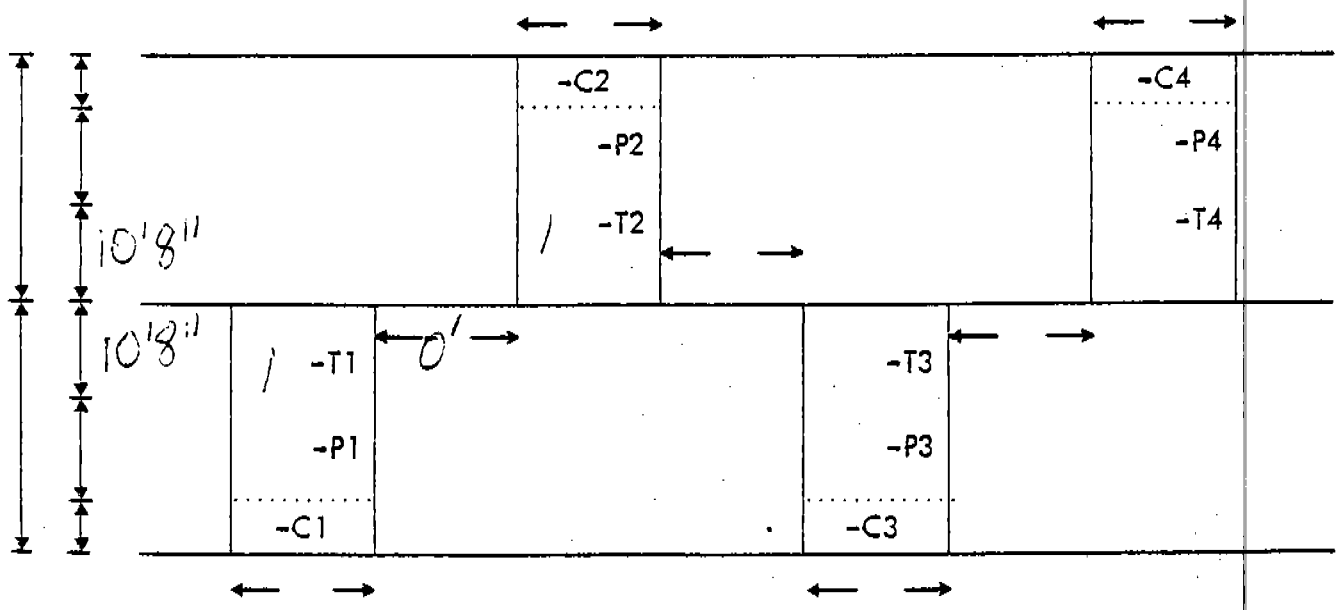
Indicate deviations from above method: Vehicle Speed ~ 30mph

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
1-T1	52	14:10	5 3/16" x	5 ~~218.4~~
1-T2	53		10'	220.5 ~~g~~

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. 1
MRI Project No. 4332L-1

Recorded by RB

Material: Paved Road Dust — Lackawanna Plant across from sewage treatment plant

Sample No: #1

Total Sample Weight: 218.1 g (I)
(Excl. Container)
Number of Splits: 0

Oven Temperature —
Date In — Date Out —
Time In — Time Out —
Drying Time —
Split Sample Balance:
Make —
Capacity —
Smallest Division —

Split Sample Weight (before drying)
Pan + Sample: —
Pan: —
Wet Sample: —

Material Weight (after drying)
Pan + Material: —
Pan: —
Dry Sample: —

MOISTURE CONTENT:
(A) Wet Sample Wt. —
(B) Dry Sample Wt. —
(C) Difference Wt. —

$\frac{C \times 100}{A}$ = — % Moisture

Sieving

Time: Start:	Weight (Pan Only)
Initial (Tare): 16:12	
20 min:	
30 min:	
40 min: 16:52	

Start 16:12

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in	553.7	553.3	0	
~~0.375~~ 4 in.	535.0	537.3	2.3	
10 mesh	468.3	495.6	27.3	
20 mesh	420.6	474.7	54.1	
40 mesh	400.2	436.5	36.5	
100 mesh	357.2	393.7	36.5	
140 mesh	352.7	368.9	16.1	
200 mesh	349.6	367.9	18.3	
Pan	372.7	396.1	23.4	

Total 214.5

Net Weight <20 mesh: —
Net Weight <200 mesh: —

% Silt: = $\frac{\text{Net Weight} < 200 \text{ Mesh}}{\text{Total Net Weight}}$ X 100 = — X 100 = 10.9%

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332 L-1

Sampling Data
Paved Roads

Date 11/3/78
Recorded by RB

Type of Material Sampled: Roadway Dust
Site of Sampling: between South & Well on Ingham, near Treatment Plant
Type of Pavement: Asphalt Surface Condition New

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

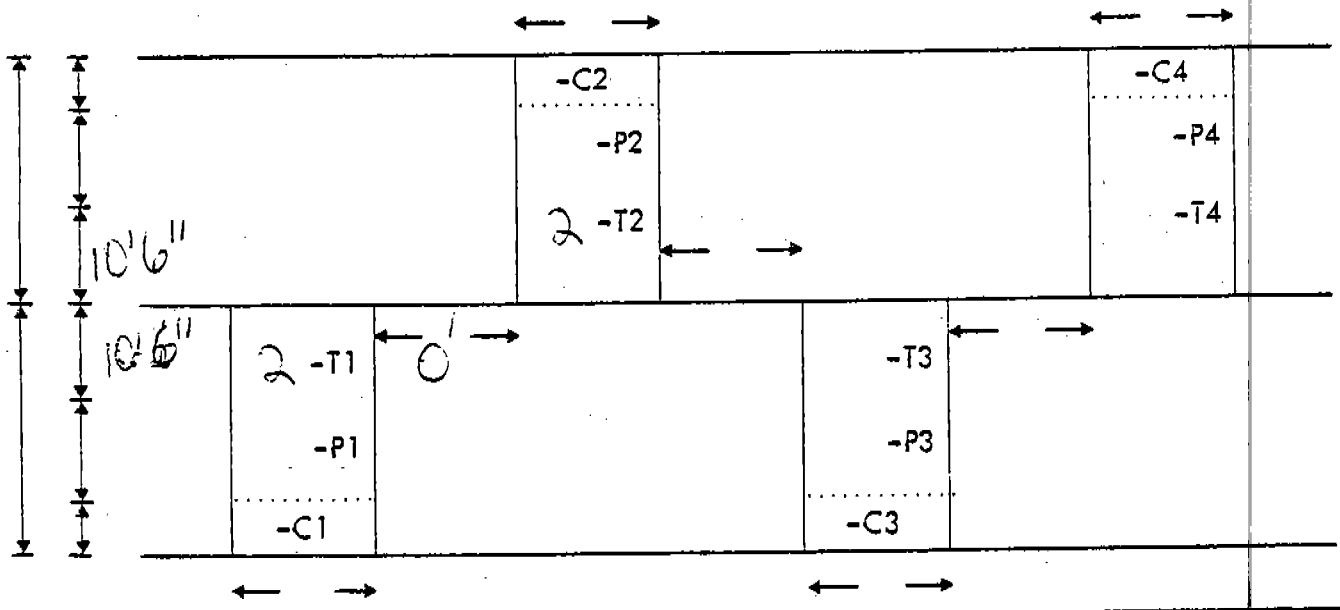
Indicate deviations from above method: Vehicle Speed ~30mph, moved around when loading

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
2-T1	54	14:30	21x10'	3076.9
2-T2	55			

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. 2
MRI Project No. 4332L-1
Recorded by RB

Material: Paved Road Dust on Ingham St. Sample No: #2

Total Sample Weight: ~~M 307.6~~ 305.9 g
(Excl. Container) —
Number of Splits: —

Oven Temperature —
Date In — Date Out —
Time In — Time Out —
Drying Time —
Split Sample Balance:
Make —
Capacity —
Smallest Division —

MOISTURE CONTENT:
(A) Wet Sample Wt. —
(B) Dry Sample Wt. —
(C) Difference Wt. —

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: —
Pan: —
Wet Sample: —

Material Weight (after drying)
Pan + Material: —
Pan: —
Dry Sample: —

Sieving

Time: Start:	Weight (Pan Only)
Initial (Tare): 17:10	
20 min:	
30 min:	
40 min: 17:50	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in	551.6	552.0	0.4	
~~0.375 in.~~ 4	535.9	543.9	8.0	
~~10~~ mesh	470.4	484.3	13.9	
20 mesh	440.0	455.7	15.7	
40 mesh	396.6	451.0	54.4	
100 mesh	354.4	460.8	106.4	
140 mesh	356.3	388.7	32.4	
200 mesh	346.4	380.5	34.1	
Pan	~~374.4~~ 372.5	410.6	38.1	

Net Weight <20 mesh: —
Net Weight <200 mesh: —
Total 303.4

% Silt: = $\frac{\text{Net Weight} < 200 \text{ Mesh}}{\text{Total Net Weight}}$ X 100 = _____ X 100 = 12.6 %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332 L-1

Sampling Data
Paved Roads

Date 11/3/78
Recorded by RLS

Type of Material Sampled: Roadway Dust
Site of Sampling: Ridge Road @ Friendship House -- Lackawana
Type of Pavement: Asphalt Surface Condition Cracked

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

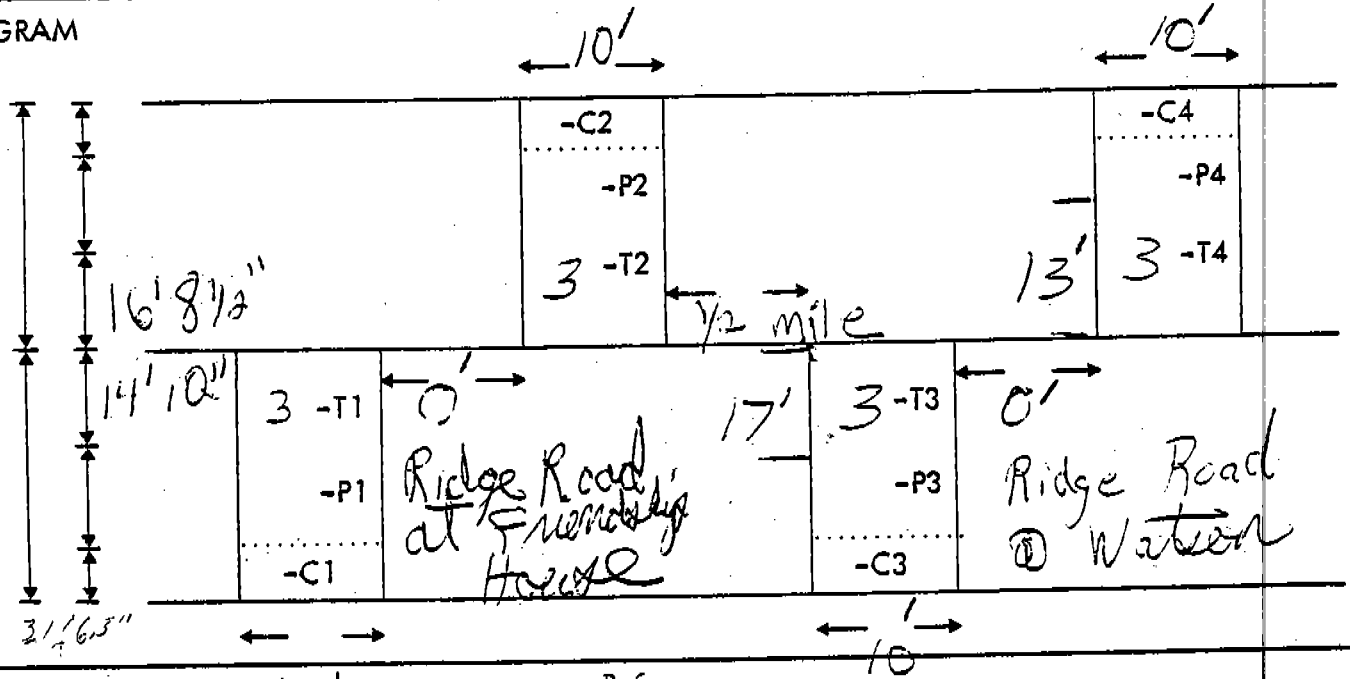
Indicate deviations from above method: Vehicle Speed ~ 30mph

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
3-T1	56	10:00	}	
3-T2	57	10:00	} 6 1/6.5" x 10'	
3-T3	11	10:30	}	
3-T4	11	10:30	} Total	
				1263 g

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332.2-1

Recorded by _____

Material: Paved Road Dust - Ridge Road at Friendship House -- Lackawanna

Sample No: 3

Total Sample Weight: ~~[illegible]~~ 12629
(Excl. Container)

Number of Splits: 0

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 12:46	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
13:26	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.9	551.9	0.	
4 mesh	536.0	537.1	1.1	
10 mesh	470.6	486.3	15.7	
20 mesh	440.1	475.0	34.9	
40 mesh	397.0	426.9	29.9	
100 mesh	354.4	375.5	21.1	
140 mesh	356.4	360.9	4.5	
200 mesh	346.5	351.4	4.9	
Pan	372.9	384.9	12.0	

Net Weight <20 mesh: 72.4
Net Weight <200 mesh: 12.0

124.1

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 9.6 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 7332 L-1 | Sampling Data Paved Roads | Date 11/3/78 Recorded by KB

Type of Material Sampled: Roadway Dust
Site of Sampling: Fuhrman Between Ridge Rd & Route 5
Type of Pavement: Asphalt Surface Condition Smooth - cracks

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

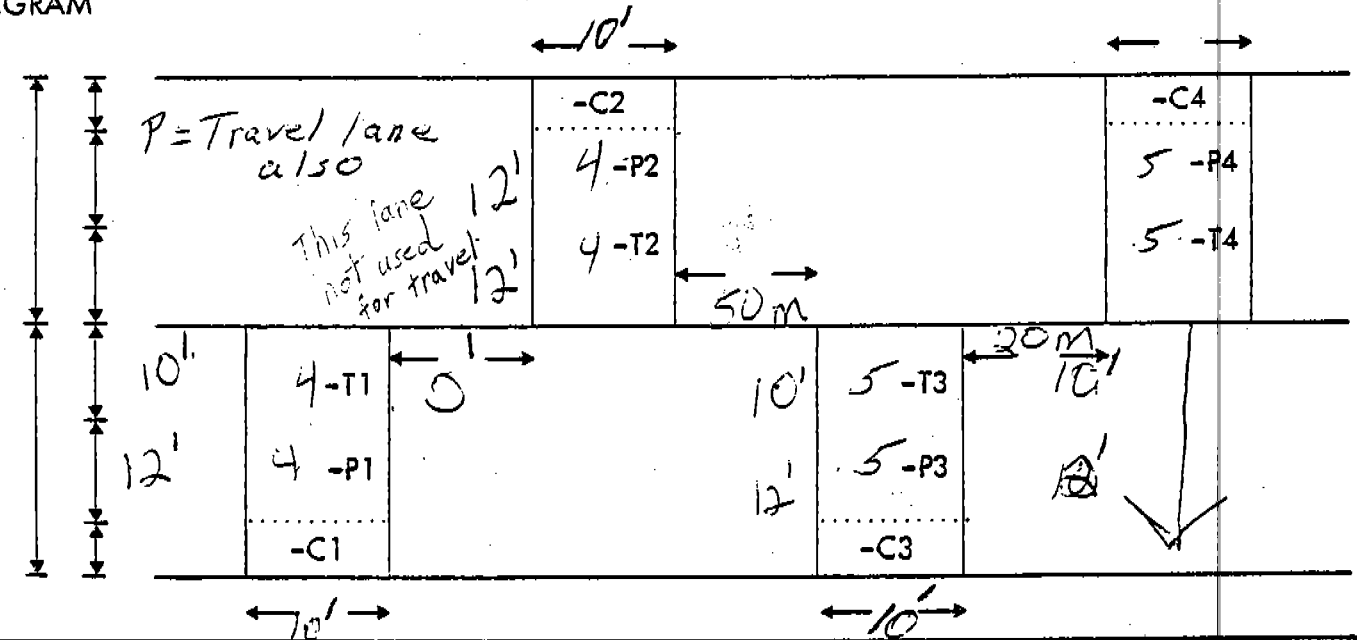
Indicate deviations from above method: Vehicle speed ~ 45mph

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
4-P1	58	11:00	46 x 10'	
4-T1	58	11		
4-T2	59	11		260.9g
4-T3				

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
5	60			
5		11:30	44 x 10'	
5	61			65.4g
5				

DIAGRAM



* Two samples on this form.

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332L-1

Recorded by _____

Material: Fuhrman Between Ridge Rd. & Route 5 Sample No: 4

Total Sample Weight: 2594g
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 14:08	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
14:48	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.5	554.3	2.8	
4 mesh	536.1	542.0	5.9	
10 mesh	470.3	502.3	32.0	
20 mesh	440.1	470.9	30.8	
40 mesh	397.0	425.3	28.3	
100 mesh	354.2	404.8	50.6	
140 mesh	356.4	376.8	20.4	
200 mesh	346.5	370.7	24.2	
Pan	372.8	435.4	62.6	

Net Weight <20 mesh: 186.1 257.6
Net Weight <200 mesh: 62.6

% Silt = $\frac{\text{Net Weight} < 200 \text{ Mesh}}{\text{Total Net Weight}}$ X 100 = 24.3 X 100 = _____ % Not representative of B

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-1

Recorded by _____

Material: Fuhrman Between Ridge Rd + Route 5 - Same Lanes

Sample No: 5

Total Sample Weight: ~~33.5g~~ 6455g
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 0822	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 0902	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.6	622.5	70.9	
4 mesh	535.9	589.6	53.7	
10 mesh	470.6	529.5	58.9	
20 mesh	440.1	475.5	35.4	
40 mesh	397.0	410.0	13.0	
100 mesh	354.3	361.0	6.7	
140 mesh	356.4	358.3	1.9	
200 mesh	346.4	348.6	2.2	
Pan	372.7	378.8	6.1	

Net Weight <20 mesh: 29.4 248.8
Net Weight <200 mesh: 6.1

% Silt: = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 2.45 X 100 = ____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332L-1

Sampling Data
Paved Roads

Date 11/3/78
Recorded by RB

Type of Material Sampled: Roadway Dust
Site of Sampling: Mystic between Alley 4 Germania
Type of Pavement: Asphalt Surface Condition Smooth

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

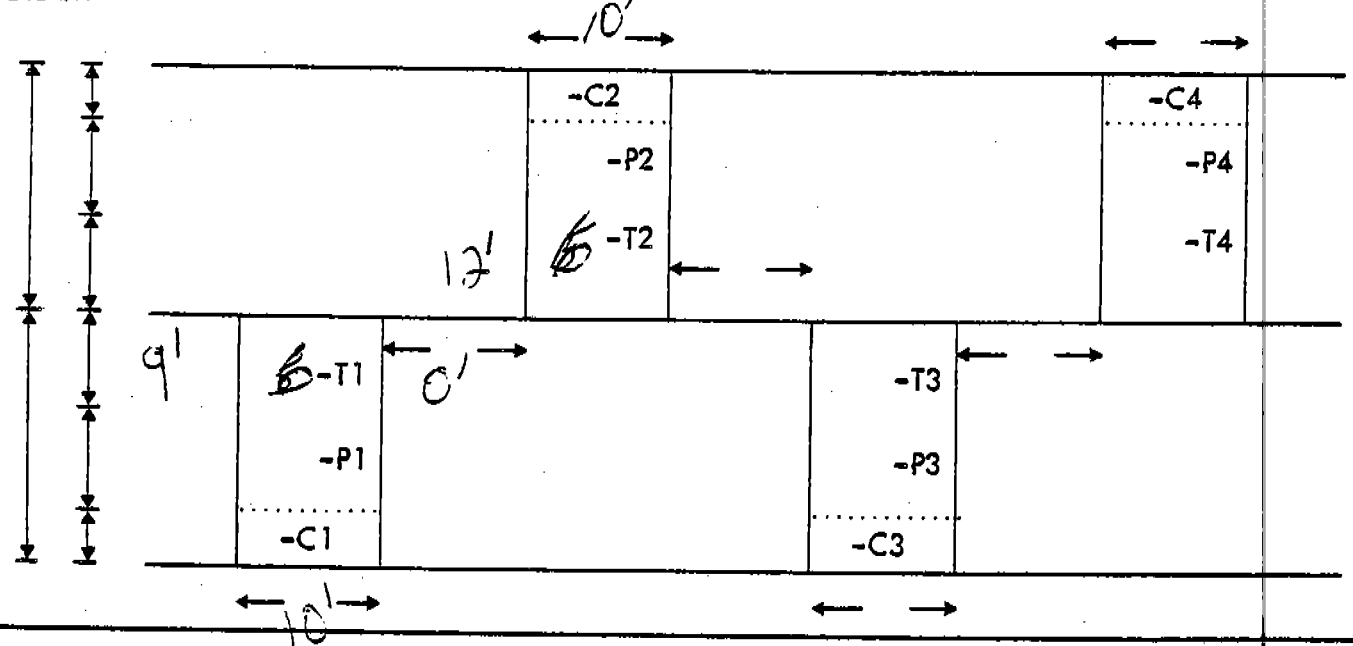
Indicate deviations from above method: Vehicle speed ~ 25mph

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
6	~~E~~ 62	14:00	21'x10'	
6	~~4~~ 63	"	"	141.3g

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 43321-1

Recorded by _____

Material: Paved Road -- Mystic Between Abby & Germania Sample No: 6

Total Sample Weight: 138.8g ~~141.3~~ g
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 1521	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min: ✓	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	552.0	552.2	0.2	
4 mesh	536.1	537.5	1.4	
10 mesh	470.5	477.8	7.3	
20 mesh	440.0	470.9	30.9	
40 mesh	397.3	430.3	33.0	
100 mesh	354.5	382.8	28.3	
140 mesh	356.6	364.4	7.8	
200 mesh	346.6	355.4	8.8	
Pan	372.9	394.1	21.2	
			138.9	

Net Weight <20 mesh: 99.1
Net Weight <200 mesh: 21.2

% Silt: = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 21.2 / 138.9 X 100 = 15.3 %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332L-1

Sampling Data
Paved Roads

Date 11/3/78
Recorded by RE

Type of Material Sampled: Roadway Dust
Site of Sampling: Germania st between Mystic & Barraga
Type of Pavement: Asphalt Surface Condition Smooth

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

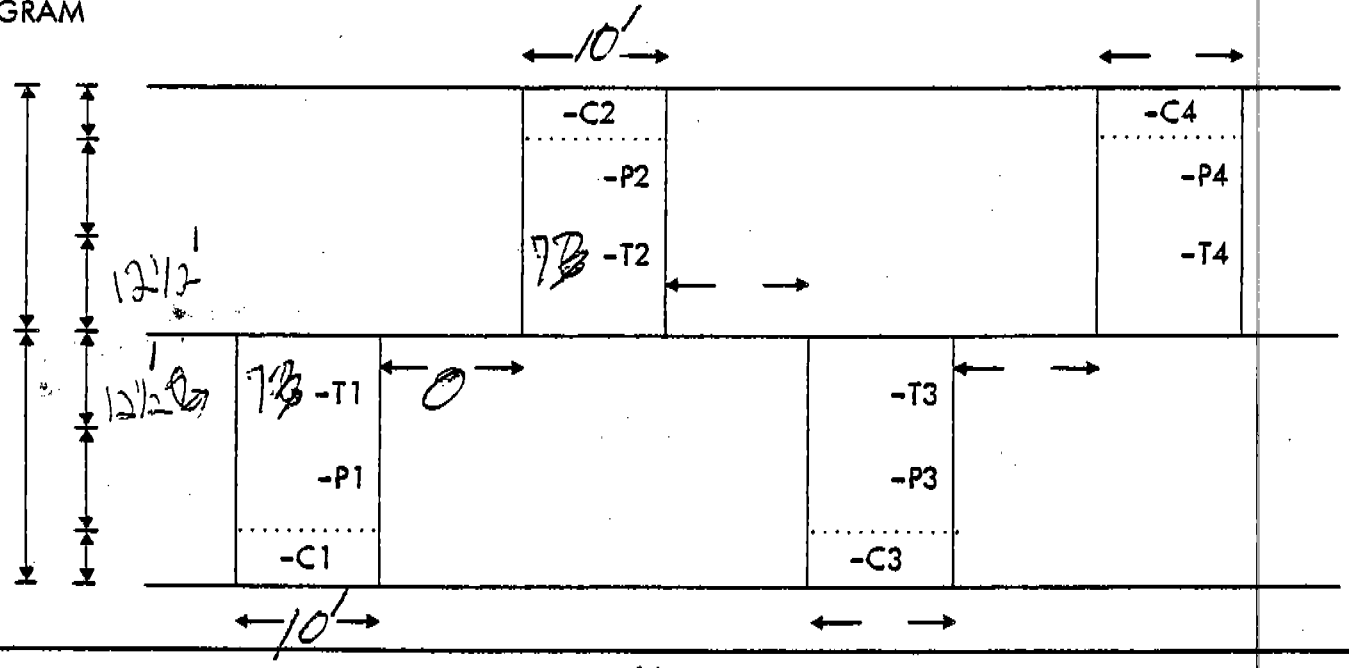
Indicate deviations from above method: Vehicle Speed ~ 25 mph

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
TB T-1	64	1510		
TB T-2	63	"	25'x10'	164.1g

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-1

Recorded by RCS

Material: Paved Road - Germania St. between Mystic and Barraga

Sample No: 7

Total Sample Weight: 162.9
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 1327	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 1407	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.0	553.1	0.1	
4 mesh	535.0	536.5	1.5	
10 mesh	468.0	473.9	5.9	
20 mesh	420.3	428.2	7.9	
40 mesh	400.0	415.0	15.0	
100 mesh	357.2	395.5	38.3	
140 mesh	352.5	366.1	13.6	
200 mesh	349.3	363.9	14.6	
Pan	374.3	439.7	65.4	

Net Weight <20 mesh: 146.9 — 162.3
Net Weight <200 mesh: 65.4

% Silt: = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 40.30 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332 L-1

Sampling Data
Unpaved Roads

Date 11/3/78
Recorded by RB

Type of Material Sampled: Slag Surfaced
Site of Sampling: ½ block south of Mystic on Germania

SAMPLING METHOD

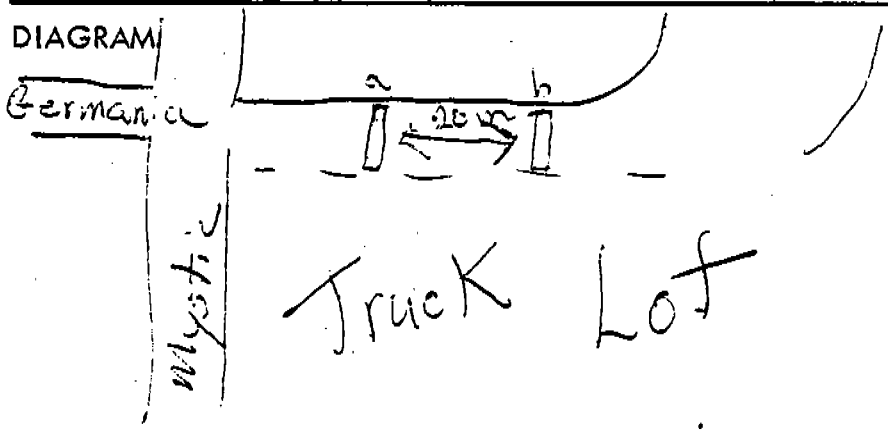
1. Sampling device: whisk broom and dust pan
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every 10 miles sampled
   (b) composite of 4 increments: lateral strips of 6" width extending over traveled portion of roadway half

Indicate deviations from above method: _____

SAMPLING DATA

Sample No.	Time	Location		Surface Area	Depth	Quantity of Sample
8	15:00	above	a	5 @ 18' x 8"	1/4"	3
			b	4 @ 21' x 8"	"	3 24 lbs

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 43322-1

Recorded by CRH

Material: Unpaved Road -- Next to Truck Lot near Mystic + Germania

Sample No: 8

Total Sample Weight: 1,312.3 g
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 1441	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.4	716.2	162.8 G	
4 mesh	535.0	735.8	200.8	
10 mesh	468.3	731.5	263.2	
20 mesh	420.6	595.5	174.9	
40 mesh	400.0	514.4	114.4	
100 mesh	357.2	520.1	162.9	
140 mesh	352.5	453.4	100.9	
200 mesh	349.3	413.9	64.6	
Pan	374.3	433.5	59.2	

Net Weight <20 mesh: 502.0 G 1303.9
Net Weight <200 mesh: 59.2 G

% Silt: = $\frac{\text{Net Weight} < 200 \text{ Mesh}}{\text{Total Net Weight}}$ X 100 = 4.5% X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332 L-1

Sampling Data
Paved Roads

Date 11/6/78
Recorded by CRM

Type of Material Sampled: ROADWAY DUST
Site of Sampling: HOPKINS AVE. NEAR TOWBRIDGE
Type of Pavement: ASPHALT Surface Condition SMOOTH

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

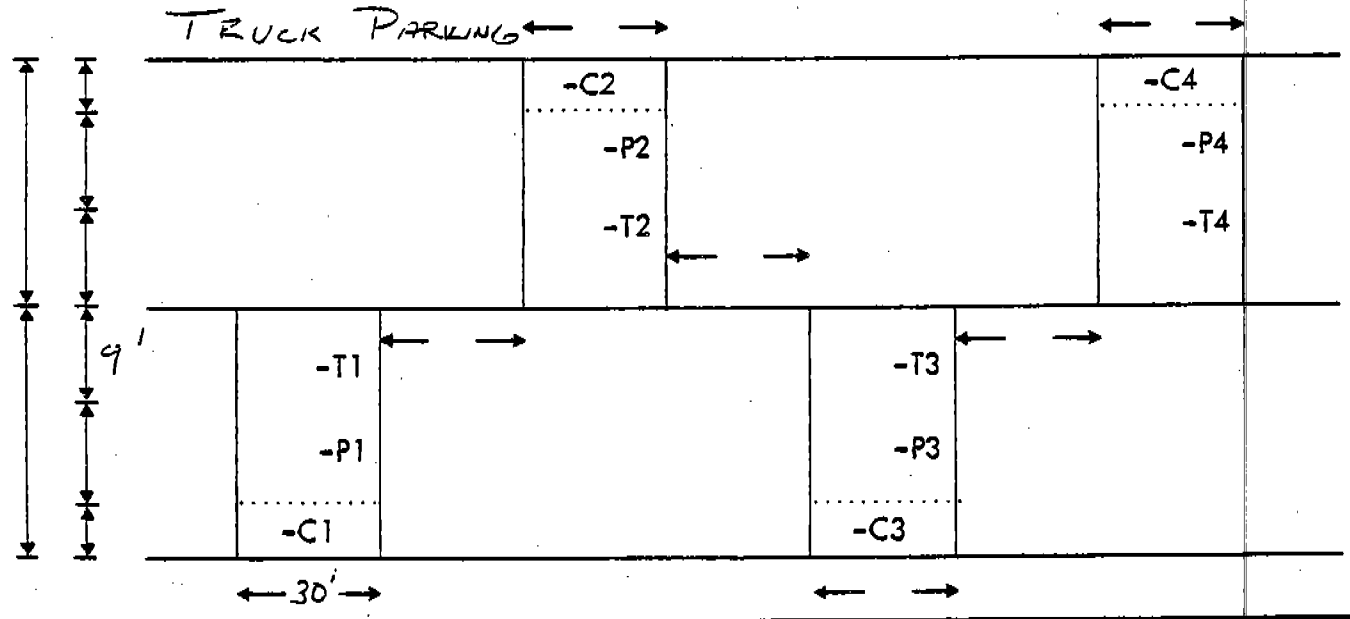
Indicate deviations from above method: VEHICLE SPEED ~30 MPH

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
9	66	0930	9'x30'	
9	67			29.7g

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332-1

Recorded by RCS

Material: Roadway Dust -- Hopkins Ave, Near Towbridge
Sample No: 9

Total Sample Weight: 28.7 g
(Excl. Container)
Number of Splits:

Oven Temperature
Date In ____ Date Out
Time In ____ Time Out
Drying Time
Split Sample Balance:
Make
Capacity
Smallest Division

MOISTURE CONTENT:
(A) Wet Sample Wt.
(B) Dry Sample Wt.
(C) Difference Wt.

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample:
Pan:
Wet Sample:

Material Weight (after drying)
Pan + Material:
Pan:
Dry Sample:

Sieving

Time: Start: 1534	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 16:14	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.1	553.1	0.0	
4 mesh	534.9	536.1	1.2	
10 mesh	468.2	471.8	3.6	
20 mesh	420.4	423.3	2.9	
40 mesh	400.1	401.1	1.0	
100 mesh	357.3	361.6	4.3	
140 mesh	352.7	355.0	2.3	
200 mesh	349.2	352.7	3.5	
Pan	374.3	383.5	9.2	

Net Weight <20 mesh: 20.3
Net Weight <200 mesh: 9.2 g
28.0

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 32.86 X 100 = ____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-L1

Sampling Data
Paved Roads

Date 11/6/78
Recorded by CRH

Type of Material Sampled: PARKING LANE & CURB DUST
Site of Sampling: HOPKINS AVE S. OF HOUSTON
Type of Pavement: ASPHALT Surface Condition SMOOTH

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

Indicate deviations from above method: VEHICLE SPEED (25)

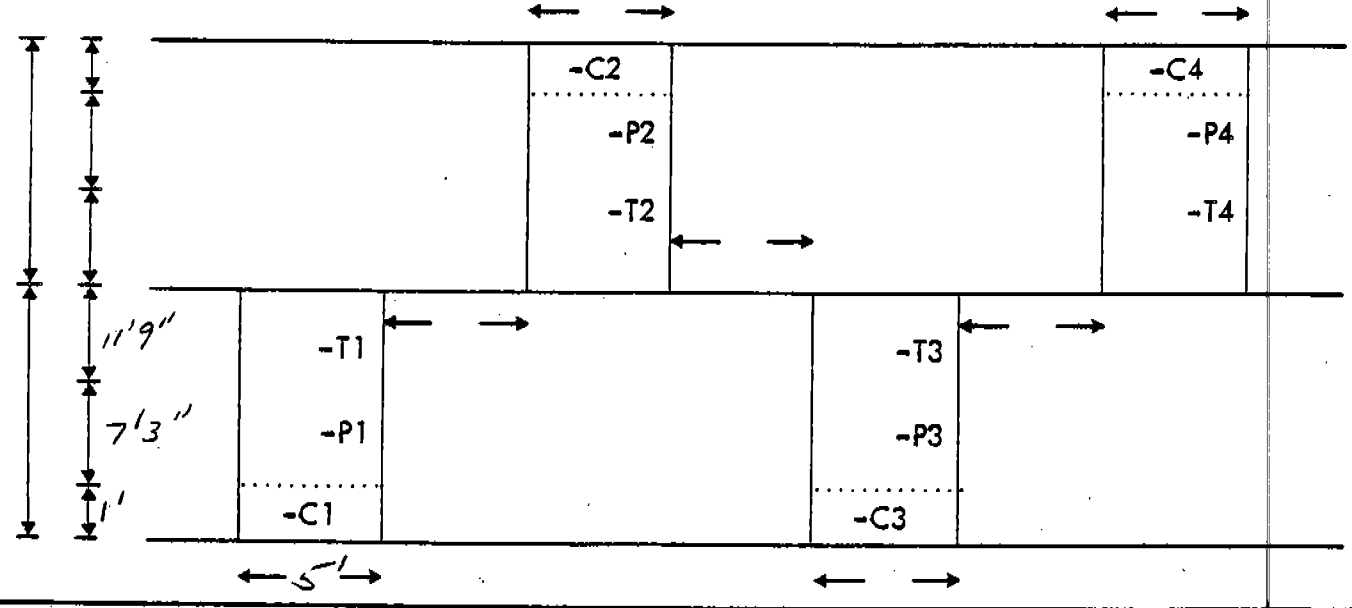
VAC. BAG #69 BROKE DURING SAMPLING.

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
10a	68	1020	5' x 7'3"	1793.7g
	69			

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
10b	70	1020	1'x5' plus hand sweeping	529.8g
→ Keep separate RB				

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332L-1

Recorded by CRH

Material: Parking Lane Dust -- Hopkins Ave. S. of Houston

Sample No: 10a

Total Sample Weight: 1793.4
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: 519.0
Pan: 13.9
Wet Sample: 505.1

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 0849A	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min: ✓	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.1	596.5	43.4	
4 mesh	534.8	554.8	20.0	
10 mesh	468.1	514.8	46.7	
20 mesh	420.3	522.1	101.8	
40 mesh	400.0	502.2	102.2	
100 mesh	357.2	455.8	98.6	
140 mesh	352.7	380.4	27.7	
200 mesh	349.4	375.0	25.6	
Pan	374.3	412.8	38.5	

Net Weight <20 mesh: 292.6
Net Weight <200 mesh: 38.5

504.5

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 7.63 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332.4-7

Recorded by CZN

Material: Curb Dust – Hopkins Ave. Near Houston Sample No: 106

Total Sample Weight: 2,823.7g
(Excl. Container)
Number of Splits: 2

Oven Temperature
Date In ____ Date Out
Time In ____ Time Out
Drying Time
Split Sample Balance:
Make
Capacity
Smallest Division

MOISTURE CONTENT:
(A) Wet Sample Wt.
(B) Dry Sample Wt.
(C) Difference Wt.

$\frac{C \times 100}{A}$ = ____ % Moisture

Split Sample Weight (before drying)
Pan + Sample:
Pan:
Wet Sample:

Material Weight (after drying)
Pan + Material: 1795.7
Pan:
Dry Sample:

Sieving

Time: Start: 1601	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min: ✓	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	~~374.3~~ 553.4	591.4	38.0	4.8
4 mesh	~~394.2~~ 535.0	539.4	4.4	0.6
10 mesh	~~352.6~~ 468.1	492.8	24.7	3.1
20 mesh	~~357.1~~ 420.2	487.5	67.3	8.6
40 mesh	400.0	533.4	133.4	17.0
100 mesh	357.1	624.1	267.0	34.0
140 mesh	352.6	454.6	102.0	13.0
200 mesh	349.3	430.8	81.5	10.4
Pan	374.3	442.0	67.7 ~~186.0~~	8.6

Net Weight <20 mesh: 651.6
Net Weight <200 mesh: 67.7

% Silt: = $\frac{\text{Net Weight} < 200 \text{ Mesh}}{\text{Total Net Weight}}$ X 100 = ____ X 100 = 8.6%

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-L1 | Sampling Data Paved Roads | Date 11/6/78 | Recorded by CRN

Type of Material Sampled: ROADWAY DUST
Site of Sampling: ABBY AVE ~ 100 YDS W OF HOPKINS
Type of Pavement: ASPHALT Surface Condition CRACKED

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

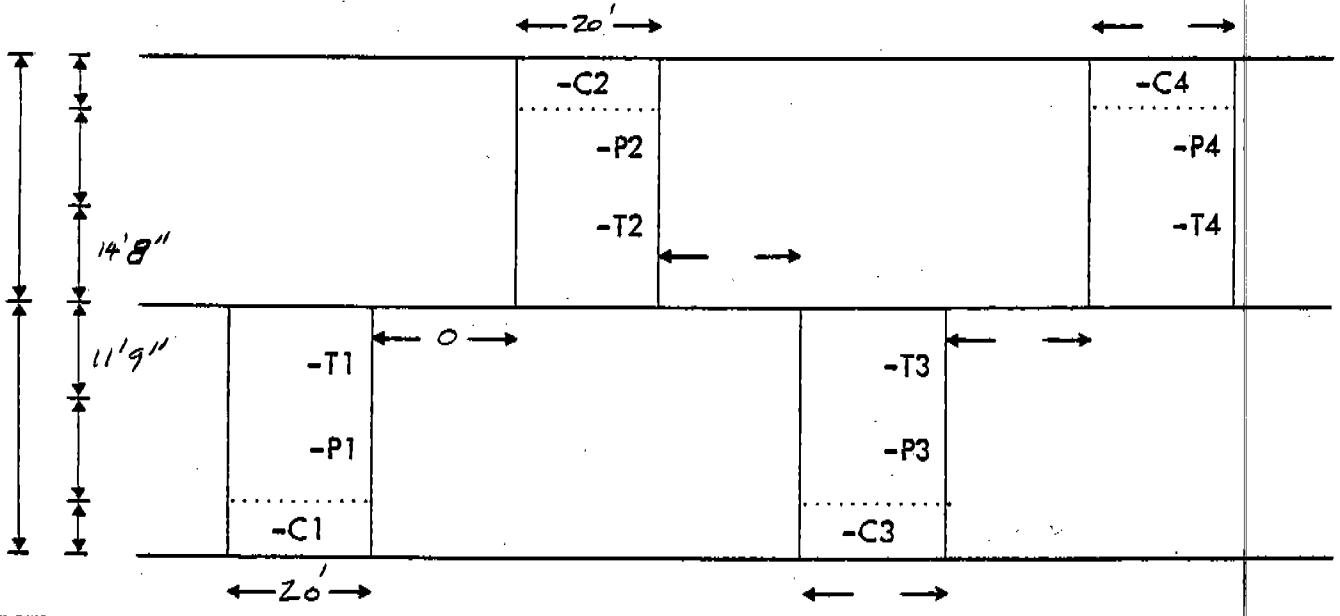
Indicate deviations from above method: VEHICLE SPEED ~ 35 MPH

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
#11	71	1030	11'9" x 20'	
	72		14'8" x 20'	281.7g

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332L-1

Recorded by RCS

Material: Roadway Dust -- Abby Ave, ~100 m W of Hopkins Sample No: 11

Total Sample Weight: 279.7
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 1528	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 1608	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.4	553.0	1.6	
4 mesh	535.8	550.2	14.4	
10 mesh	470.4	500.8	30.4	
20 mesh	440.0	494.9	54.9	
40 mesh	397.0	443.0	46.0	
100 mesh	354.4	411.2	56.8	
140 mesh	356.4	376.8	20.4	
200 mesh	346.4	364.8	18.4	
Pan	372.7	408.5	35.8	

Net Weight <20 mesh: 177.4
Net Weight <200 mesh: 35.8

~~177.4~~ 278.7

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 12.8 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-L1

Sampling Data
Paved Roads

Date 11/6/78
Recorded by GRN

Type of Material Sampled: COKE DUST ON PUBLIC ROADWAY
Site of Sampling: ABBY ROAD NEAR REPUBLIC STEEL OFFICE
Type of Pavement: ASPHALT Surface Condition CRACKED

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

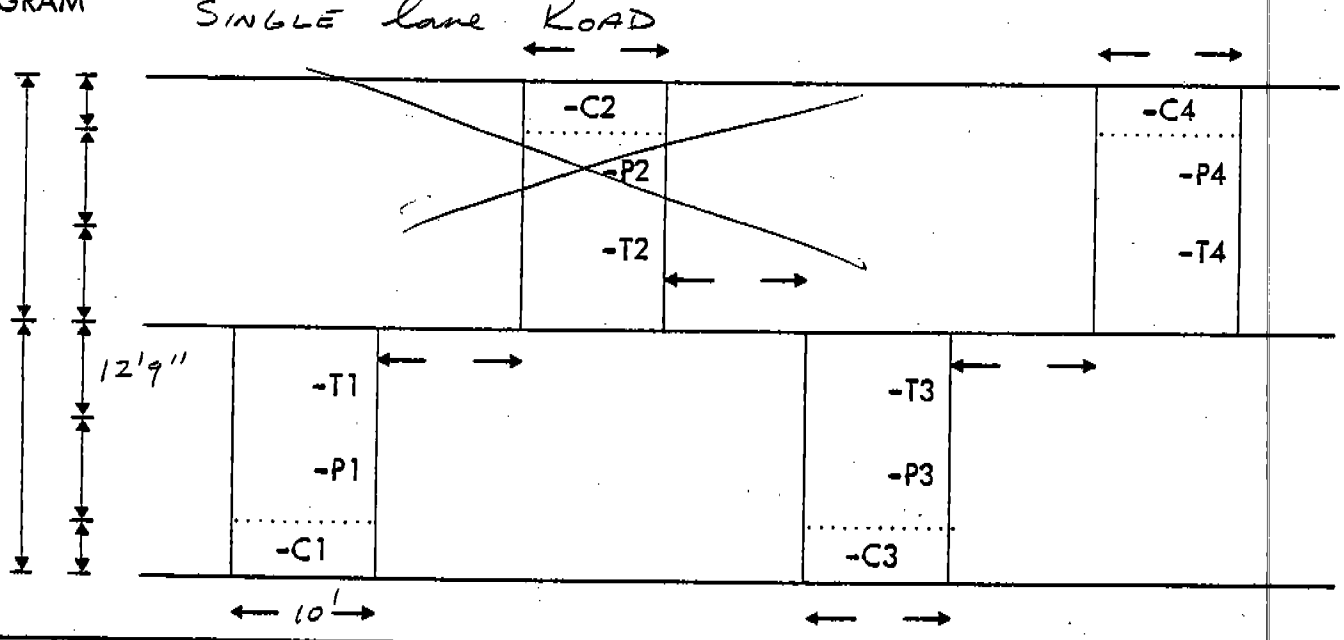
Indicate deviations from above method: VEHICLE SPEED ~20 MPH

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
12	73	1120	12'9" x 10'	
	74			366.4g

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-1

Recorded by _____

Material: Coke Dust on Paved Roadway -- Abby Rd. Near Republic Steel Office Bldg. Sample No: 12

Total Sample Weight: 3640g
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 1609	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 1649	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.2	553.5	0.3	
4 mesh	534.9	543.7	8.8	
10 mesh	468.2	499.9	31.7	
20 mesh	420.4	507.0	86.6	
40 mesh	400.2	486.5	86.3	
100 mesh	357.3	439.3	82.0	
140 mesh	352.7	374.6	21.9	
200 mesh	349.4	365.6	16.2	
Pan	374.5	403.5	29.0	

Net Weight <20 mesh: 235.4 362.8
Net Weight <200 mesh: 29.0

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 7.99 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-41

Sampling Data
Paved Roads

Date 11/6/78
Recorded by CRH

Type of Material Sampled: COKE DUST
Site of Sampling: ABBY ROAD NEAR PLANT GATE AT DONNER HANNA
Type of Pavement: ASPHALT Surface Condition CRACKED

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics – not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

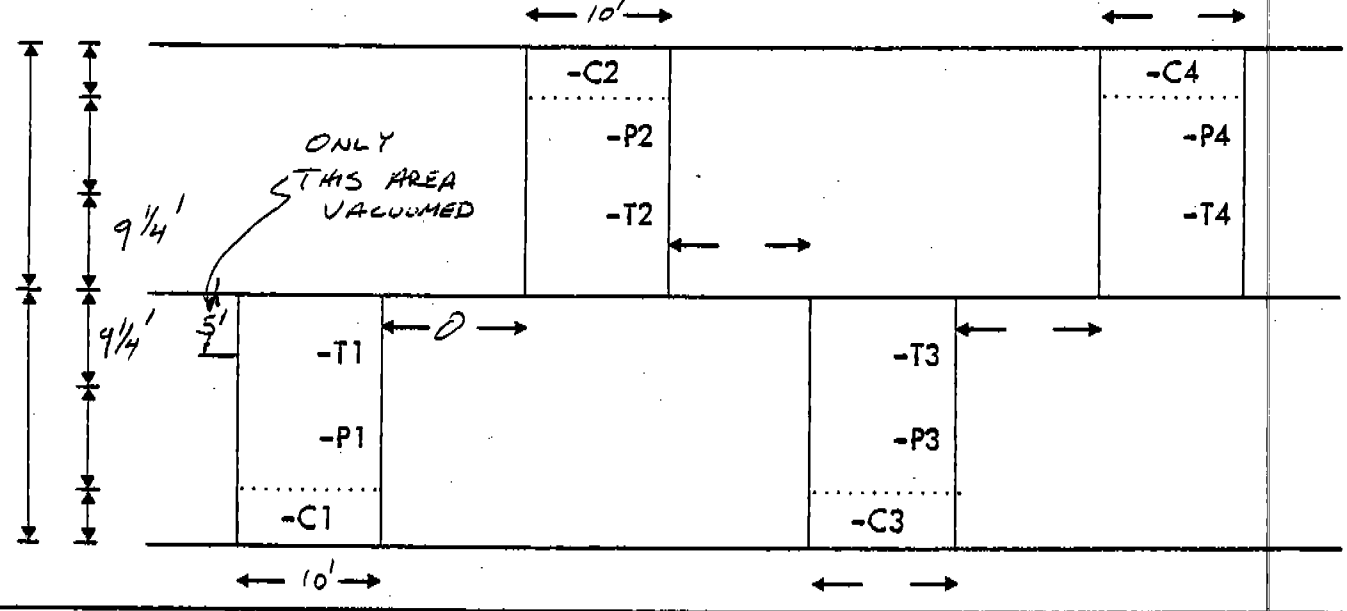
Indicate deviations from above method: VEHICLE SPEED ~ 25 MPH

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
13b	75	1145	5'x10'	9950g
	76			
~~13b~~	HAND SWEEPINGS		18.5'x10'	38 lbs.
13a				

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332.1-1

Recorded by RS + RH

Material: Paved Road - Abby Road Near Plant Gate At Donner Hanna

Sample No: 13a
Hand Sweepings

Total Sample Weight: 38 lbs.
(Excl. Container)
Number of Splits: 4

Oven Temperature 110°C
Date In 11/6/78 Date Out 11/7/78
Time In 17:00 Time Out 09:00
Drying Time
Split Sample Balance:
Make
Capacity
Smallest Division

Split Sample Weight (before drying)
Pan + Sample: 1261.5 g
Pan: 13.9
Wet Sample: 1247.6

Material Weight (after drying)
Pan + Material: 1246.9 g
Pan: 13.9
Dry Sample: 1233.0

MOISTURE CONTENT:
(A) Wet Sample Wt. 1247.6
(B) Dry Sample Wt. 1233.0
(C) Difference Wt. 14.6

$\frac{C \times 100}{A}$ = 1.2 % Moisture

Sieving

Time: Start: 1311	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.9 553.6	814.5	260.9 g	
4 mesh	536.3 535.2	687.1	151.9	
10 mesh	470.5 468.4	632.0	163.6	
20 mesh	440.3 420.3	550.1	129.8	
40 mesh	396.8 400.2	498.4	98.2	
100 mesh	394.4 357.2	568.5	211.3	
140 mesh	356.4 352.5	455.1	102.6	
200 mesh	346.5 349.6	405.7	56.1	
Pan	372.8 374.5	434.2	59.7	
			1234.1	

Net Weight <20 mesh: 527.9 g
Net Weight <200 mesh: 59.7 g

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 4.79 X 100 = ____ %

4.8 %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332L-1

Recorded by CRH

Material: Paved Road - Abby Road Wear Plant Gate At Donner Hannel
Sample No: 13 b
Vac, Bags

Total Sample Weight: 885.0 g
(Excl. Container)
Number of Splits: 3

Oven Temperature ~~Ambient~~
Date In ~~[illegible]~~ Date Out ~~[illegible]~~
Time In ~~[illegible]~~ Time Out ~~[illegible]~~
Drying Time ~~[illegible]~~
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: 148.1
Pan: 13.9
Wet Sample: 134.2

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 1355	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min: ✓	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	552.0	551.7	-0.3 (ϕ)	
4 mesh	536.1	535.9	-0.2 (ϕ)	
10 mesh	470.7	471.3	0.6	.4
20 mesh	440.1	443.4	3.3	2.5
40 mesh	396.9	405.4	8.5	6.4
100 mesh	354.2	396.5	42.3	31.7
140 mesh	356.3	380.0	23.7	17.8
200 mesh	346.6	374.5	27.9	20.9
Pan	372.9	400.1	27.2	20.4

Net Weight <20 mesh: ~~[illegible]~~ 129.6 TOTAL = 133.5
Net Weight <200 mesh: 27.2

% Silt: = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 20.4 X 100 = ~~[illegible]~~ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332 L-1

Sampling Data
Unpaved Roads

Date 11/6/78

Recorded by KB

Type of Material Sampled: Slag Surfaced Roadway

Site of Sampling: Baraga St. ~ 70m from Abby St.

SAMPLING METHOD

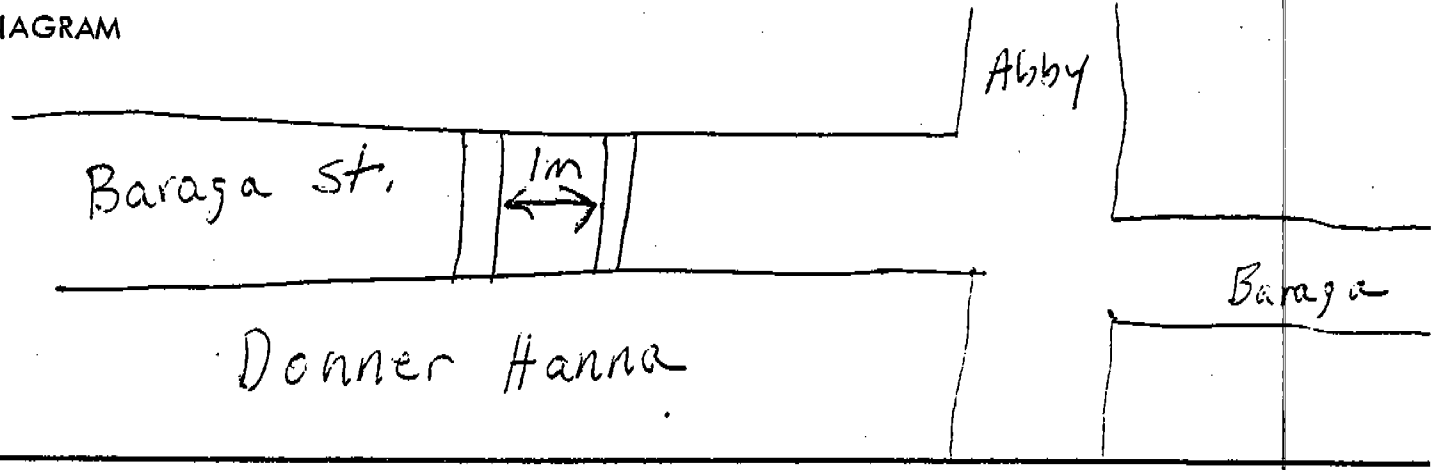
1. Sampling device: whisk broom and dust pan
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every 10 miles sampled
   (b) composite of 4 increments: lateral strips of 6" width extending over traveled portion of roadway half

Indicate deviations from above method: _____

SAMPLING DATA

Sample No.	Time	Location	Surface Area	Depth	Quantity of Sample
14a	14:00		.31" x 10"	1/4"	36 lbs
14b			.31" x 10"	1/4"	34
					34
					27 lbs
					131 lbs.
				Total	

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332L-1

Recorded by _____

Material: Baraga St. ~70m from Abby next to Domer Hanna Plant, unpaved road Sample No: 14

Total Sample Weight: 131 lbs.
(Excl. Container)
Number of Splits: 6

Oven Temperature _____
Date In 11/6/78 Date Out 11/7/78
Time In 17:00 Time Out 09:00
Drying Time 16 Hours
Split Sample Balance:
Make OHAUS
Capacity 2610 g
Smallest Division 0.1 g

MOISTURE CONTENT:
(A) Wet Sample Wt. 998.4
(B) Dry Sample Wt. 982.1
(C) Difference Wt. 16.3

$\frac{C \times 100}{A}$ = 1.6 % Moisture

Split Sample Weight (before drying)
Pan + Sample: 1012.3
Pan: 13.9
Wet Sample: 998.4

Material Weight (after drying)
Pan + Material: 996.0 g
Pan: 13.9 f
Dry Sample: 982.1

Sieving

Time: Start: 0907	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min: ✓	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen) (g)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	[redacted] 551.9	648.6	[redacted] 96.7	9.9
4 mesh	[redacted] 536.3	727.3	[redacted] 191.0	19.6
10 mesh	470.4	693.2	[redacted] 222.8	22.9
20 mesh	440.1	592.3	152.2	15.6
40 mesh	396.9	491.1	94.2	9.7
100 mesh	354.4	459.5	105.1	10.8
140 mesh	356.3 g	395.0	38.7	4.0
200 mesh	346.2 g	385.6	39.4	4.0
Pan	372.9	407.6	34.7	3.6

Net Weight <20 mesh: 464.3
Net Weight <200 mesh: 34.7

TOTAL = [redacted] 974.8

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X [redacted] X 100 = ~~3.5~~ 3.6 %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-L1

Sampling Data
Unpaved Roads

Date 11/6/78
Recorded by CRM

Type of Material Sampled: COKE DUST
Site of Sampling: TRACK 14 ON PUSHING SIDE OF OVENS

SAMPLING METHOD

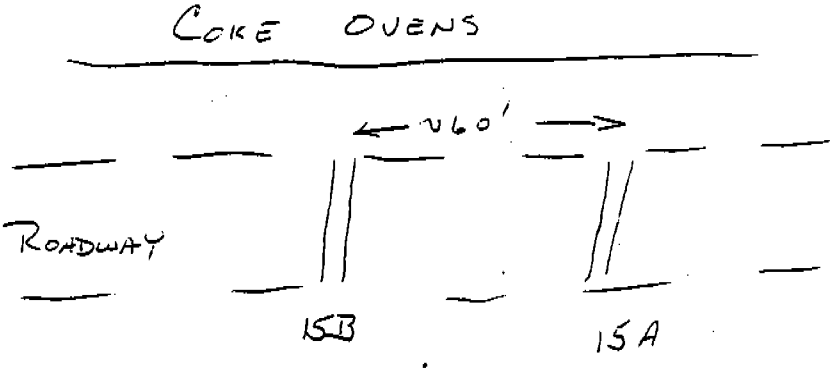
1. Sampling device: whisk broom and dust pan
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every 10 miles sampled
   (b) composite of 4 increments: lateral strips of 6" width extending over traveled portion of roadway half

Indicate deviations from above method: VEHICLE SPEED ~10 MPH

SAMPLING DATA

Sample No.	Time	Location	Surface Area	Depth	Quantity of Sample
15A	1500		10" x 13'	1/4"	20#
15B	1515		10" x 15'	1/4"	20#
				Total	40 lbs.

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332.2-1

Recorded by CRH

Material: Track 14 - Unpaved Road at Donner Hanna Coke Plant

Sample No: 15

Total Sample Weight: 4016s
(Excl. Container)
Number of Splits: 4

Oven Temperature 110°C
Date In 11/6/78 Date Out 11/7/78
Time In ~~1700~~ Time Out 0915
Drying Time 16.25 HRS
Split Sample Balance:
Make OHAUS
Capacity 2610 g
Smallest Division 0.1g

Split Sample Weight (before drying)
Pan + Sample: 1,199.7g
Pan: 27.8g
Wet Sample: 1171.9

Material Weight (after drying)
Pan + Material: 1,180.0 g
Pan: 27.8 g
Dry Sample: [a] 1152.2

MOISTURE CONTENT:
(A) Wet Sample Wt. 1171.9
(B) Dry Sample Wt. 1152.2
(C) Difference Wt. 19.7

$\frac{C \times 100}{A}$ = 1.7 % Moisture

1111A Sieving

Time: Start: ~~0950~~	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min: ✓	

[a] SOME SAMPLE LOST DUE TO LAB ACCIDENT. TOTAL SAMPLE WT. BEFORE SCREENING: 1148.1 g

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)		Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	539.4	551.9	703.3	151.4	13.2
4 mesh	535.7	536.3	634.3	98.0	8.5
10 mesh	456.6	470.5	598.8	128.3	11.2
20 mesh	409.4	440.3	565.6	125.3	10.9
40 mesh	400.2	396.8	524.6	127.8	11.1
100 mesh	347.5	354.4	593.0	238.6	20.8
140 mesh	353.1	356.4	487.7	131.3	11.4
200 mesh	349.8	346.5	444.5	98.0	8.5
Pan	375.1	372.8	422.3	49.5	4.3

Net Weight <20 mesh: 645.2
Net Weight <200 mesh: 49.5

1,143.2

% Silt: = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = ~~_____~~ X 100 = 4.3 %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-L1

Sampling Data
Paved Roads

Date 11/6/78
Recorded by CRH

Type of Material Sampled: COKE DUST
Site of Sampling: ABBY ST. EXTENSION, BETWEEN S. BUFFALO RD + GATE CULVER
Type of Pavement: SPRAYED + CHIPPED Surface Condition BROKEN

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

Indicate deviations from above method: VEHICLE SPEED ~ 20 mph

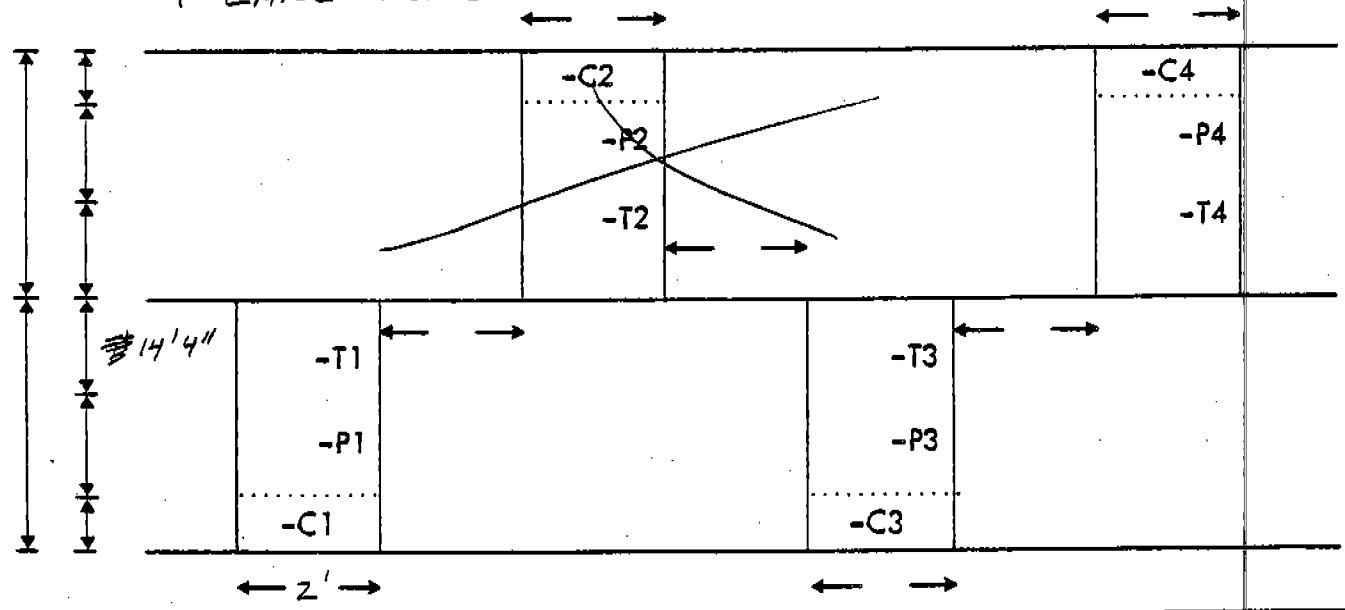
SAMPLING DATA

NOTE: SURFACE HAND SWEPT BEFORE VACUUMING
TOTAL WT. OF HAND-SWEPT SAMPLE: 16#

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
16a	77	1430	~~2'x14'4"~~	
	78		~~3'x10'~~	1534g
			3'x~~8~~	
	d	Torn, discarded		

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
16b	Hand	Sweeping	14'4"x2'	
				~~8[illegible]g~~
				16 lbs.

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332L-1

Recorded by CRK

Material: Coke dust -- Abby St. extension, between S. Buffalo Rd. & Gate Culvert

Sample No: 16a

Total Sample Weight: 131.9 g
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 0809A	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min: ✓	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	552.1	551.8	−0.3 *	
4 mesh	536.3	536.4	0.1	
10 mesh	470.8	473.9	3.1	
20 mesh	440.3	447.6	7.3	
40 mesh	397.1	411.7	14.6	
100 mesh	354.6	407.9	53.3	
140 mesh	356.7	385.5	28.8	
200 mesh	346.9	366.5	19.6	
Pan	373.1	375.5	2.4	

Net Weight <20 mesh: 118.7 129.2
Net Weight <200 mesh: 2.4

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 1.86 X 100 = _____ %

*Indicate Units with all Weights

* Negative value not used. Assumed to be zero

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332L-1

Recorded by CRH

Material: Abby St. Extension – Hand Sweepings Sample No: 16 b

Total Sample Weight: 16 lbs
(Excl. Container)
Number of Splits: 3

Oven Temperature
Date In ____ Date Out ____
Time In ____ Time Out ____
Drying Time
Split Sample Balance:
Make
Capacity
Smallest Division

MOISTURE CONTENT:
(A) Wet Sample Wt.
(B) Dry Sample Wt.
(C) Difference Wt.

$\frac{C \times 100}{A}$ = ____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: ~~9777~~
Pan:
Wet Sample:

Material Weight (after drying)
Pan + Material: 888.4
Pan: 13.9
Dry Sample: 874.5 a/

Sieving

Time: Start: 1019A	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min: ✓	

a/ Sample was split 2 times before sieving

SIZE DISTRIBUTION

Screen	Tare Weight (Screen) (g)	Final Weight (Screen + Sample) (g)	Net Weight (Sample) (g)	%
3/8 in.	~~374.2~~ 553.2	556.5	3.3	1.4
4 mesh	534.9	548.0	13.1	5.6
10 mesh	468.4	499.5	31.1	13.3
20 mesh	420.3	456.1	35.8	15.3
40 mesh	400.0	434.3	34.3	14.7
100 mesh	357.0	418.5	61.5	26.3
140 mesh	352.4	373.1	20.7	8.9
200 mesh	349.1	371.4	22.3	9.5
Pan	374.2	385.8	11.6	5.0

Net Weight <20 mesh: 150.4 g (64.4 %) 233.7
Net Weight <200 mesh: 11.6 g

% Silt: = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 5.0 % ~~X 100 = ____ %~~

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332L-1

Sampling Data
Storage Piles

Date 11/9/78
Recorded by RB

Type of Material Sampled: Crushed Stone Bethlehem
Site of Sampling: East Side of Bethlehem

SAMPLING METHOD

1. Sampling device: pointed shovel
2. Sampling depth: 4 - 6 inches
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every pile sampled
   (b) composite of 10 increments
5. Minimum portion of stored material (at one site) to be sampled: 25%

Indicate deviations from above method: _____

SAMPLING DATA

Sample No.	Time	Location (Refer to map)	Surface Area	Depth	Quantity of Sample
17	10:00			3"	50 lbs.

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-C1

Recorded by CRL

Material: Crushed Stone - Bethlehem Steel Sample No: 17
East Storage
Total Sample Weight: 80 lbs.
(Excl. Container)
Number of Splits: 5

Oven Temperature 105 C
Date In 11/9/78 Date Out 11/9/78
Time In 17:00 Time Out 17:00
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

Split Sample Weight (before drying)
Pan + Sample: 1140.0 g
Pan: 14.2 g
Wet Sample: 1125.8

Material Weight (after drying)
Pan + Material: ~~1125.8~~ 1115.2
Pan: 14.2 g
Dry Sample: _____

Sieving

Time: Start: 1125	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
12:46	

Stop 1120
Re-Start 1221

MOISTURE CONTENT:
(A) Wet Sample Wt. 1125.8
(B) Dry Sample Wt. 1101.1
(C) Difference Wt. 24.8

$\frac{C \times 100}{A}$ = 2.20 % Moisture

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.1	555.3	2.2	
4 mesh	534.9	651.5	116.6	
10 mesh	468.2	834.4	366.2	
20 mesh	420.5	673.5	253.0	
40 mesh	400.4	510.7	110.3	
100 mesh	357.4	444.7	87.3	
* 140 mesh	352.8	411.6	58.8	
200 mesh	349.5	394.0	44.5	
Pan	374.5	434.7	60.2	
			1099.1	

Net Weight <20 mesh: 361.1 g
Net Weight <200 mesh: 60.2 g

% Silt = $\frac{\text{Net Weight} < 200 \text{ Mesh}}{\text{Total Net Weight}}$ X 100 = 5.48 X 100 = _____ %

*Indicate Units with all Weights

* NOTE: Screen No. 140 appears to be caked up with fines and has larger particles on top of fines.

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332L-1

Sampling Data
Storage Piles

Date 11/8/78

Recorded by

Type of Material Sampled: Dead Storage Pellets

Site of Sampling: East Area - Bethlehem

SAMPLING METHOD

1. Sampling device: pointed shovel
2. Sampling depth: 4 - 6 inches
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every pile sampled
   (b) composite of 10 increments
5. Minimum portion of stored material (at one site) to be sampled: 25%

Indicate deviations from above method:

SAMPLING DATA

Sample No.	Time	Location (Refer to map)	Surface Area	Depth	Quantity of Sample
19	10:00	East Storage		4"	70 lbs

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332-7

Recorded by CRK

Material: Pellets- Dead Storage Bethlehem Sample No: 18

Total Sample Weight: 70 lbs.
(Excl. Container)
Number of Splits: 5

Oven Temperature 105 C
Date In 11/3/78 Date Out 11/4/78
Time In 17:00 Time Out 17:00
Drying Time
Split Sample Balance:
Make
Capacity
Smallest Division

MOISTURE CONTENT:
(A) Wet Sample Wt. 1066.7 g
(B) Dry Sample Wt. 1049.0
(C) Difference Wt. 17.7

$\frac{C \times 100}{A}$ = 1.66 % Moisture

Split Sample Weight (before drying)
Pan + Sample: 1050.6 g
Pan: 13.9 g
Wet Sample: 1066.7 g

Material Weight (after drying)
Pan + Material: 1062.9 g
Pan: 13.9 g
Dry Sample: 1049.0 g

Sieving

Time: Start: 0817	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 0857	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.8	1524.7	972.9	
4 mesh	535.9	561.2	25.3	
10 mesh	470.4	470.8	0.4	
20 mesh	440.0	440.9	0.9	
40 mesh	397.0	398.0	1.0	
100 mesh	354.4	357.5	3.1	
140 mesh	356.4	361.1	4.7	
200 mesh	346.5	351.0	4.5	
Pan	372.8	409.6	36.8	

Net Weight <20 mesh: 50.1 1049.6
Net Weight <200 mesh: 36.8

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 3.51 X 100 = ____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-L

Sampling Data
Storage Piles

Date 11/8/78
Recorded by CRH

Type of Material Sampled: COAL
Site of Sampling: EAST STORAGE AREA

SAMPLING METHOD

1. Sampling device: pointed shovel
2. Sampling depth: 4 - 6 inches
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every pile sampled
   (b) composite of 10 increments
5. Minimum portion of stored material (at one site) to be sampled: 25%

Indicate deviations from above method:

SAMPLING DATA 5 SPLITS

Sample No.	Time	Location (Refer to map)	Surface Area	Depth	Quantity of Sample
19	1015			3"	30#

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-4

Recorded by CRH

Material: Coal

Sample No: 19

Total Sample Weight: 30#
(Excl. Container)
Number of Splits: 5

Oven Temperature 105 C
Date In 11/8/78 Date Out 11/9/78
Time In 17:00 Time Out 17:00
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

Split Sample Weight (before drying)
Pan + Sample: 394.4 g
Pan: 14.1 g
Wet Sample: 380.3

Material Weight (after drying)
Pan + Material: 380.1 g
Pan: 14.1 g
Dry Sample: 366.0

MOISTURE CONTENT:
(A) Wet Sample Wt. 380.3
(B) Dry Sample Wt. 366.0
(C) Difference Wt. 14.3

$\frac{C \times 100}{A}$ = 3.76 % Moisture

Sieving

Time: Start: 1535	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 1635	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.3	558.0	4.7	
4 mesh	535.0	568.3	33.3	
10 mesh	468.2	551.7	83.5	
20 mesh	420.3	501.3	81.0	
40 mesh	400.0	451.4	51.4	
100 mesh	357.2	411.7	54.5	
140 mesh	352.6	372.1	19.5	
200 mesh	349.5	361.7	12.2	
Pan	374.5	402.7	28.2	

Net Weight <20 mesh: 165.8 g
Net Weight <200 mesh: 28.2 g

368.3 g

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 7.66 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-L1

Sampling Data
Storage Piles

Date 11/8/78
Recorded by C.R.H

Type of Material Sampled: LUMP IRON ORE
Site of Sampling: KNOB HILL STORAGE PILE

SAMPLING METHOD

1. Sampling device: pointed shovel
2. Sampling depth: 4 - 6 inches
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every pile sampled
   (b) composite of 10 increments
5. Minimum portion of stored material (at one site) to be sampled: 25%

Indicate deviations from above method: _____

SAMPLING DATA 4 SPLITS

Sample No.	Time	Location (Refer to map)	Surface Area	Depth	Quantity of Sample
20	1040A			4"	60 #

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-41

Recorded by CRH

Material: IRON ORE (LUMP)

Sample No: 20 a

Total Sample Weight: 60 #
(Excl. Container)
Number of Splits: 4
Oven Temperature 105 C
Date In 11/8/78 Date Out 11/9/78
Time In 17:00 Time Out 17:00
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

Split Sample Weight (before drying)	a	b
Pan + Sample:	1371.3	1127.1
Pan:	14.2 g	14.1 g
Wet Sample:	1357.1 g	

Material Weight (after drying)	a	b
Pan + Material:	1280.0	1036.9
Pan:	14.2	
Dry Sample:	1265.8	

MOISTURE CONTENT:
(A) Wet Sample Wt. 1357.1
(B) Dry Sample Wt. 1265.8
(C) Difference Wt. 91.3 g

$\frac{C \times 100}{A}$ = 6.73 % Moisture

Sieving

Time: Start: 0858	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 0938	

SIZE DISTRIBUTION

Screen	* Tare Weight (Screen)		Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.4		1090.2	537.8	
4 mesh	534.9		710.0	175.1	
10 mesh	568.2		588.5	20.3	
20 mesh	420.2		504.0	83.8	
40 mesh	400.1		484.5	84.4	
100 mesh	356.5		509.9	153.4	
140 mesh	352.0		411.4	59.4	
200 mesh	349.1		361.2	12.1	
Pan	374.0		418.0	44.0	

Net Weight <20 mesh: 353.3 1170.3
Net Weight <200 mesh: 44.0

% Silt: = $\frac{\text{Net Weight} < 200 \text{ Mesh}}{\text{Total Net Weight}}$ X 100 = 3.76 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332-21

Recorded by RCS

Material: Iron Ore (Lump)

Sample No: 20 lb

Total Sample Weight: 60 #
(Excl. Container)
Number of Splits: 4

Oven Temperature 105 C
Date In 11-8-78 Date Out 11-9-78
Time In 17:00 Time Out 17:00
Drying Time
Split Sample Balance:
Make
Capacity
Smallest Division

Split Sample Weight (before drying)
Pan + Sample: 1127.1
Pan: 14.1
Wet Sample: 1113.0

Material Weight (after drying)
Pan + Material: 1036.9
Pan: 14.1
Dry Sample: 1022.8

MOISTURE CONTENT:
(A) Wet Sample Wt. 1113.0
(B) Dry Sample Wt. 1022.8
(C) Difference Wt. 90.2

$\frac{C \times 100}{A}$ = 8.1 % Moisture

Sieving

Time: Start: 09:40	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min: 10:20	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.8	768.7	216.9	
4 mesh	536.1	632.5	96.4	
10 mesh	470.1	605.6	135.5	
20 mesh	440.0	564.3	124.3	
40 mesh	396.9	542.8	145.9	
100 mesh	353.9	536.2	182.3	
140 mesh	356.4	422.6	66.2	
200 mesh	346.4	365.2	18.8	
Pan	372.9	414.3	41.4	

Net Weight <20 mesh: 454.6 1027.7
Net Weight <200 mesh: 41.4

% Silt:= $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 4.03 X 100 = ____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-L1

Sampling Data
Storage Piles

Date 11/8/78
Recorded by CRH

Type of Material Sampled: PELLETS
Site of Sampling: ACTIVE STORAGE PILE NEAR BLAST FURNACE

SAMPLING METHOD

1. Sampling device: pointed shovel
2. Sampling depth: 4 - 6 inches
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every pile sampled
   (b) composite of 10 increments
5. Minimum portion of stored material (at one site) to be sampled: 25%

Indicate deviations from above method: _____

SAMPLING DATA 4 SPLITS

Sample No.	Time	Location (Refer to map)	Surface Area	Depth	Quantity of Sample
21	1100A			4"	60#

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-41

Recorded by CRH

Material: PELLETS - ACTIVE STORAGE NEAR BLAST FURNACE Sample No: 21

Total Sample Weight: 60#
(Excl. Container)
Number of Splits: 4

Oven Temperature 105 C
Date In 11/3/78 Date Out 11/4/78
Time In 17:00 Time Out 17:00
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

Split Sample Weight (before drying)
Pan + Sample: 1515.1
Pan: 14.1 g
Wet Sample: 1501.0 g

Material Weight (after drying)
Pan + Material: 1434.4 g
Pan: 14.1 g
Dry Sample: 1470.3 g

MOISTURE CONTENT:
(A) Wet Sample Wt. 1501.0 g
(B) Dry Sample Wt. 1470.3 g
(C) Difference Wt. 30.7 g

$\frac{C \times 100}{A}$ = 2.05 % Moisture

Sieving

Time: Start: 1024	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.4	1187.8	634.4 g	
4 mesh	535.2	1110.7	575.5	
10 mesh	468.5	556.6	88.1	
20 mesh	420.4	444.9	24.5	
40 mesh	400.1	407.9	7.8	
100 mesh	357.3	366.6	9.3	
140 mesh	352.8	371.2	18.4	
200 mesh	349.4	362.2	12.8	
Pan	374.5	474.2	99.7	

Net Weight <20 mesh: 140.2 g
Net Weight <200 mesh: 99.7 g

1462.7 g

% Silt: = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 6.82 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-4

Sampling Data
Storage Piles

Date 11/8/78
Recorded by CRH

Type of Material Sampled: LIMESTONE
Site of Sampling: ACTIVE STORAGE PILE NEAR BLAST FURNACE

SAMPLING METHOD

1. Sampling device: pointed shovel
2. Sampling depth: 4 - 6 inches
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every pile sampled
   (b) composite of 10 increments
5. Minimum portion of stored material (at one site) to be sampled: 25%

Indicate deviations from above method: _____

SAMPLING DATA 3 SPLITS

Sample No.	Time	Location (Refer to map)	Surface Area	Depth	Quantity of Sample
22	1140A			5"	43#

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-L1

Recorded by RCS

Material: Limestone (Active Pile Near Blast Furnace) Sample No: 22 a

Total Sample Weight: _____
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: 990.8
Pan: 14.0
Wet Sample: 976.8

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 0903	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 0908	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.1	1519.3	966.2	
4 mesh				
10 mesh				
20 mesh				
40 mesh				
100 mesh				
140 mesh				
200 mesh				
Pan				

Net Weight <20 mesh: _____
Net Weight <200 mesh: _____

% Silt: = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = _____ X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-21

Recorded by RCS

Material: Limestone (Active pile near blast furnace) Sample No: 22 b

Total Sample Weight: _____
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: 858.2
Pan: 13.9
Wet Sample: 844.3

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 0909	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 0916	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.5	1393.7	~~842.2~~ 842.2	
4 mesh				
10 mesh				
20 mesh				
40 mesh				
100 mesh				
140 mesh				
200 mesh				
Pan				

Net Weight <20 mesh: _____
Net Weight <200 mesh: _____

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = _____ X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332 -21 Recorded by RCS

Material: _____ Sample No: 22 c

Total Sample Weight: _____
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: 782.2
Pan: 14.2
Wet Sample: 768.0

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 0918	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
STOP 0923	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.0	1319.7	766.7	
4 mesh				
10 mesh				
20 mesh				
40 mesh				
100 mesh				
140 mesh				
200 mesh				
Pan				

Net Weight <20 mesh: _____
Net Weight <200 mesh: _____

% Silt: = $\frac{\text{Net Weight} < 200 \text{ Mesh}}{\text{Total Net Weight}}$ X 100 = _____ X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-L1

Recorded by CRH

Material: LIMESTONE (ACTIVE PILE NEAR BLAST FURNACE) Sample No: 22

Total Sample Weight: 43#
(Excl. Container)
Number of Splits: 3

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: 2589.1

Sieving

Time: Start: 0903	Weight (Pan Only)
Initial (Tare):	
15 ~~min~~: 0924	
30 min:	
40 min:	
STOP 0949	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.1		2575.1 *	
4 mesh	534.8	534.8	0.0	
10 mesh	468.1	468.4	0.3	
20 mesh	420.4	420.6	0.2	
40 mesh	400.2	400.4	0.2	
100 mesh	357.3	358.2	0.9	
140 mesh	352.7	353.5	0.8	
200 mesh	349.4	350.9	1.5	
Pan	374.5	384.8	10.3	

Net Weight <20 mesh: 13.7 — 2589.3
Net Weight <200 mesh: 10.3

% Silt: = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 0.40 X 100 = _____ %

*Indicate Units with all Weights

* Sum of 22a, 22b, 22c

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-41

Sampling Data
Paved Roads

Date 11/8/78
Recorded by CRH

Type of Material Sampled: ROADWAY DUST (STEEL PLANT RT. 7 ADJACENT TO BLAST FURNACE J)
Site of Sampling: BETHLEHEM STEEL -
Type of Pavement: ASPHALT Surface Condition SMOOTH

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

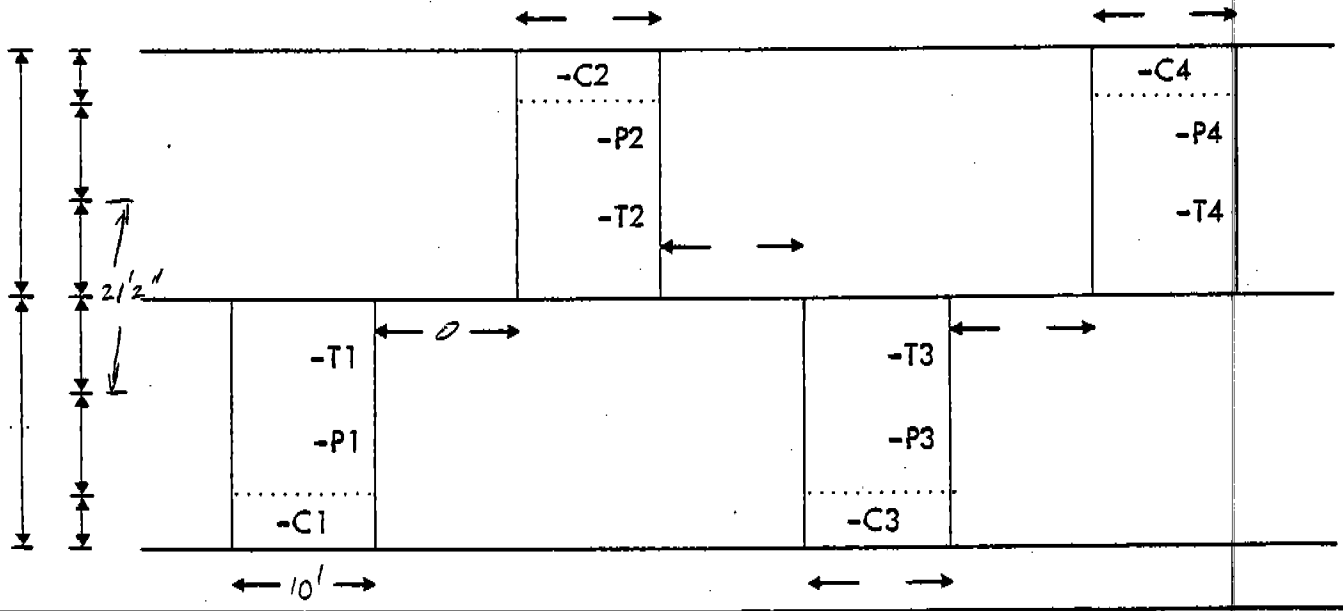
Indicate deviations from above method: VEHICLE SPEED : 25 MPH

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
[redacted]	80	1415	10' x 21'2"	
23	81			

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-4

Recorded by CRH

Material: ROADWAY DUST

Sample No: 23

Total Sample Weight: 498.4
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 0903	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min: 0943	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.9	585.3	33.4 g	
4 mesh	536.0	555.6	19.6	
10 mesh	470.5	505.9	35.4	
20 mesh	440.1	560.5	120.4	
40 mesh	397.2	484.5	87.3	
100 mesh	354.5	437.3	82.8	
140 mesh	356.6	392.5	35.9	
200 mesh	346.5	400.4	53.9	
Pan	372.9	400.0	27.1	

Net Weight <20 mesh: 287.0 g
Net Weight <200 mesh: 27.1 g

495.8

% Silt: = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 5.47 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-L

Sampling Data
Paved Roads

Date 11/8/78
Recorded by CRN

Type of Material Sampled: ROADWAY DUST
Site of Sampling: BETHLEHEM STEEL - RT 8 SOUTH OF SHIP CANAL
Type of Pavement: ASPHALT Surface Condition SMOOTH

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

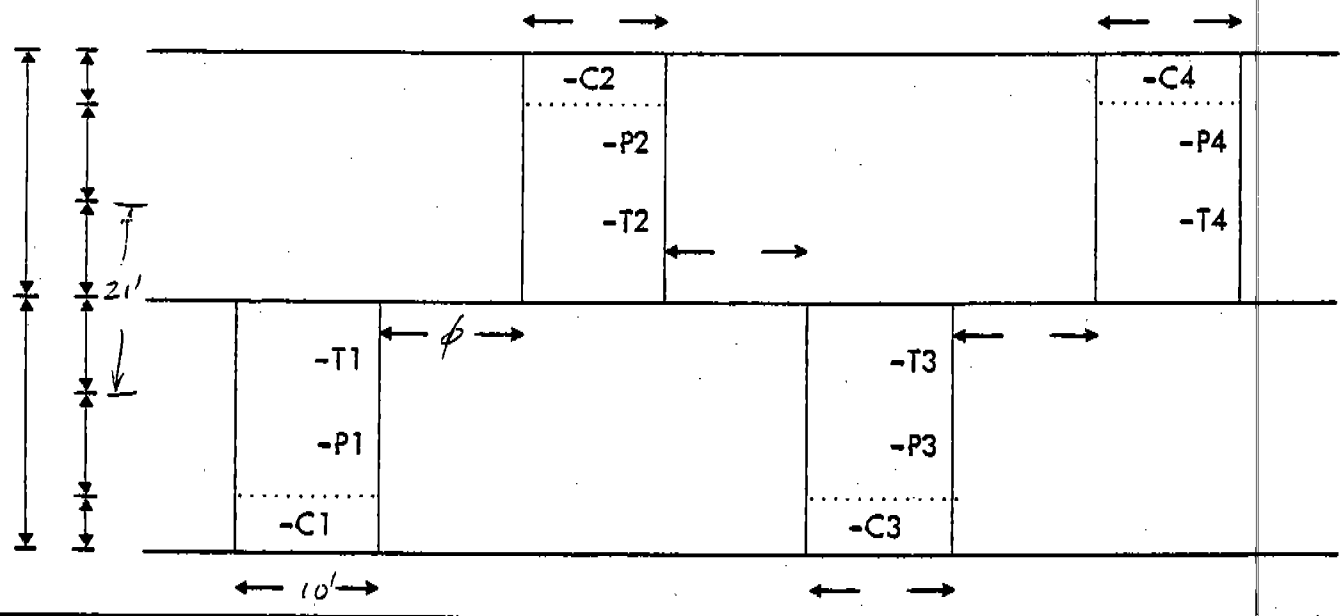
Indicate deviations from above method: VEHICLE SPEED = 25 MPH

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
24	82	1500	10'x21'	
	83			

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-C

Recorded by CRH

Material: ROADWAY DUST

Sample No: 24

Total Sample Weight: 1268.0
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 1248	Weight (Pan Only)
Initial (Tare): 313.28	
20 min:	
30 min:	
40 min:	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.4	569.0	15.6	
4 mesh	535.0	548.8	13.8	
10 mesh	468.4	511.7	43.3	
20 mesh	420.5	556.8	136.3	
40 mesh	400.3	512.9	112.6	
100 mesh	357.3	490.1	132.8	
140 mesh	352.7	413.4	60.7	
200 mesh	349.5	388.6	39.1	
Pan	374.4	413.8	39.4	

Net Weight <20 mesh: 384.6 593.6
Net Weight <200 mesh: 39.4 g

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 6.64 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-41

Sampling Data
Paved Roads

Date 11/8/78
Recorded by CRH

Type of Material Sampled: ROADWAY DUST
Site of Sampling: BETHLEHEM STEEL - RT. 11 W OF COAL PILE
Type of Pavement: ASPHALT Surface Condition SMOOTH

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

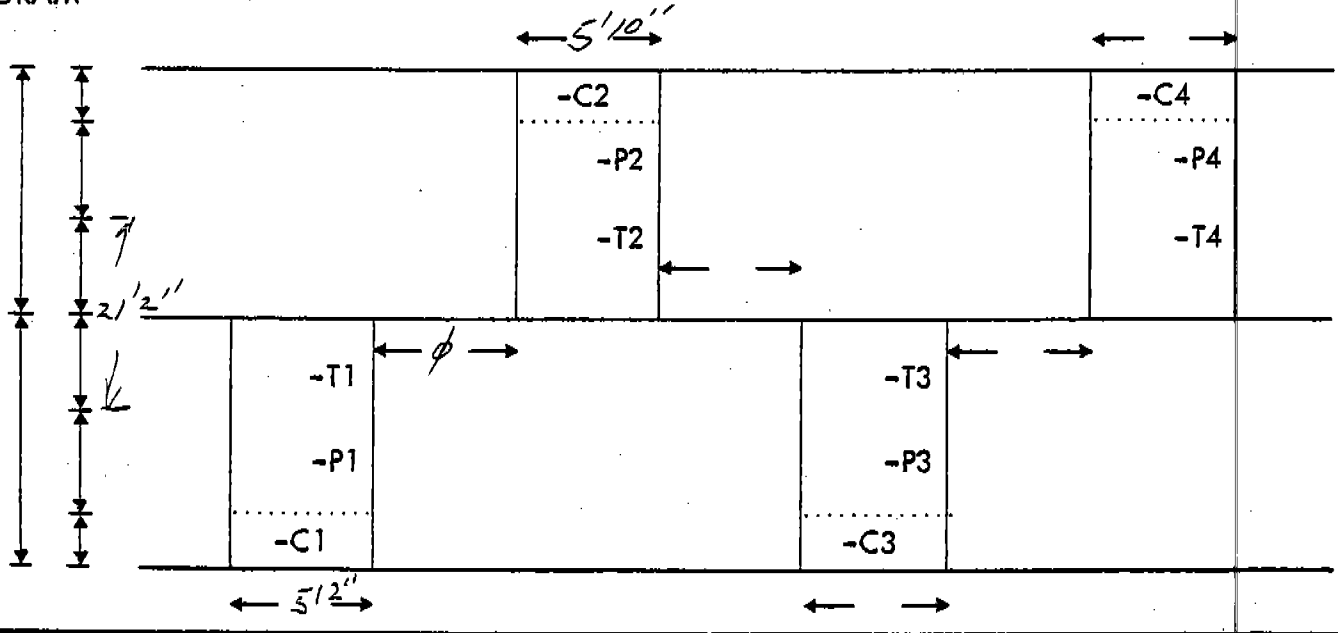
Indicate deviations from above method: VEHICLE SPEED = 30 MPH

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
25	84	1530		

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-41

Recorded by CRH

Material: ROADWAY DUST

Sample No: 25

Total Sample Weight: 222.8
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 14:12	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
14:52	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	552.8	584.4	31.6	
4 mesh	534.8	568.1	33.3	
10 mesh	468.2	490.8	22.6	
20 mesh	420.2	477.1	56.9	
40 mesh	400.2	444.7	44.5	
100 mesh	357.1	377.9	20.8	
140 mesh	352.1	356.1	4.0	
200 mesh	349.3	352.3	3.0	
Pan	373.9	382.1	8.2	

Net Weight <20 mesh: 80.5 224.9
Net Weight <200 mesh: 8.2

% Silt = $\frac{\text{Net Weight} < 200 \text{ Mesh}}{\text{Total Net Weight}}$ X 100 = 3.6 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-41

Sampling Data
Paved Roads

Date 11/8/78
Recorded by CRK

Type of Material Sampled: ROADWAY DUST
Site of Sampling: BETHLEHEM STEEL - ROAD 3 ADJACENT TO HEARTH 1
Type of Pavement: ASPHALT Surface Condition SMOOTH

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

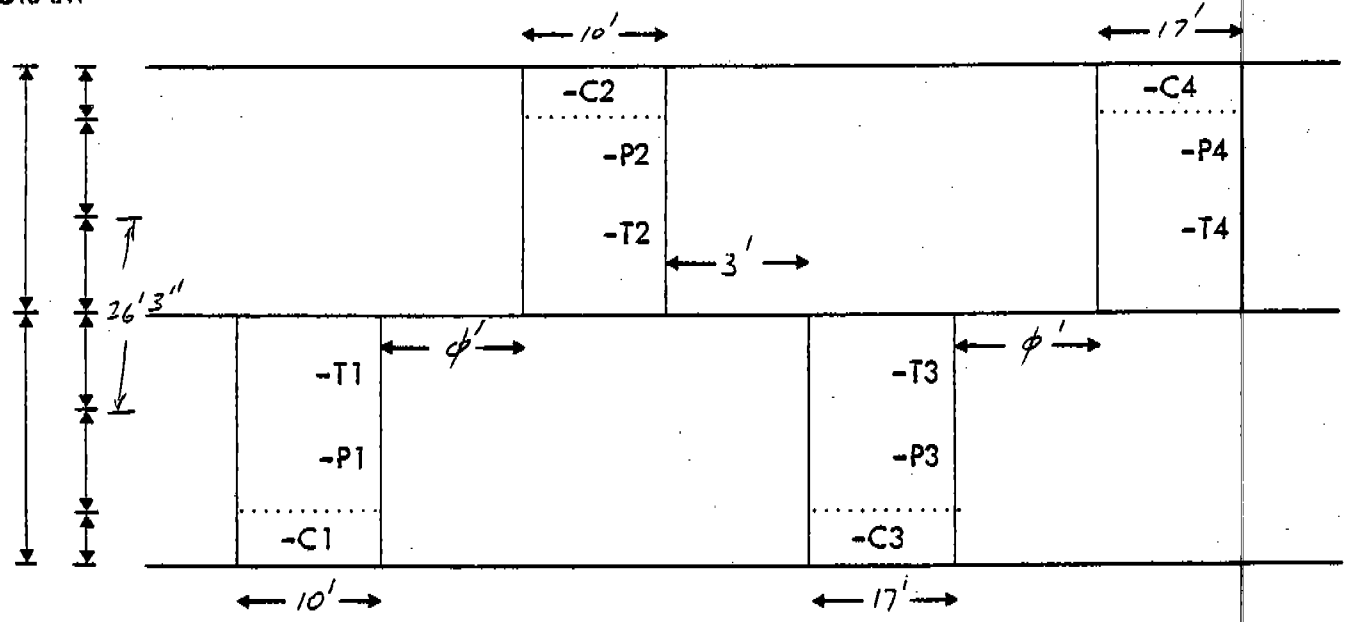
Indicate deviations from above method: VEHICLE SPEED = 40MPH

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
26	85	1615	17'x26'3"	
	86			

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-L

Recorded by CRN

Material: Roadway Dust

Sample No: 26

Total Sample Weight: 148.5
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 0940A	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min: ✓	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.7	586.3	34.6	
4 mesh	535.8	560.8	25.0	
10 mesh	470.3	489.7	19.4	
20 mesh	440.0	454.0	14.0	
40 mesh	396.7	409.9	13.2	
100 mesh	354.3	372.4	18.1	
140 mesh	356.5	361.4	4.9	
200 mesh	346.5	352.0	5.5	
Pan	373.0	386.1	13.1	

Net Weight <20 mesh: 54.8 147.8
Net Weight <200 mesh: 13.1

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 8.86 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332L-1

Sampling Data
Paved Roads

Date 11/9/78
Recorded by

Type of Material Sampled: Roadway Dust
Site of Sampling: Republic Steel -- Access Adjacent to 18" Barrier
Type of Pavement: Asphalt Surface Condition Smooth

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

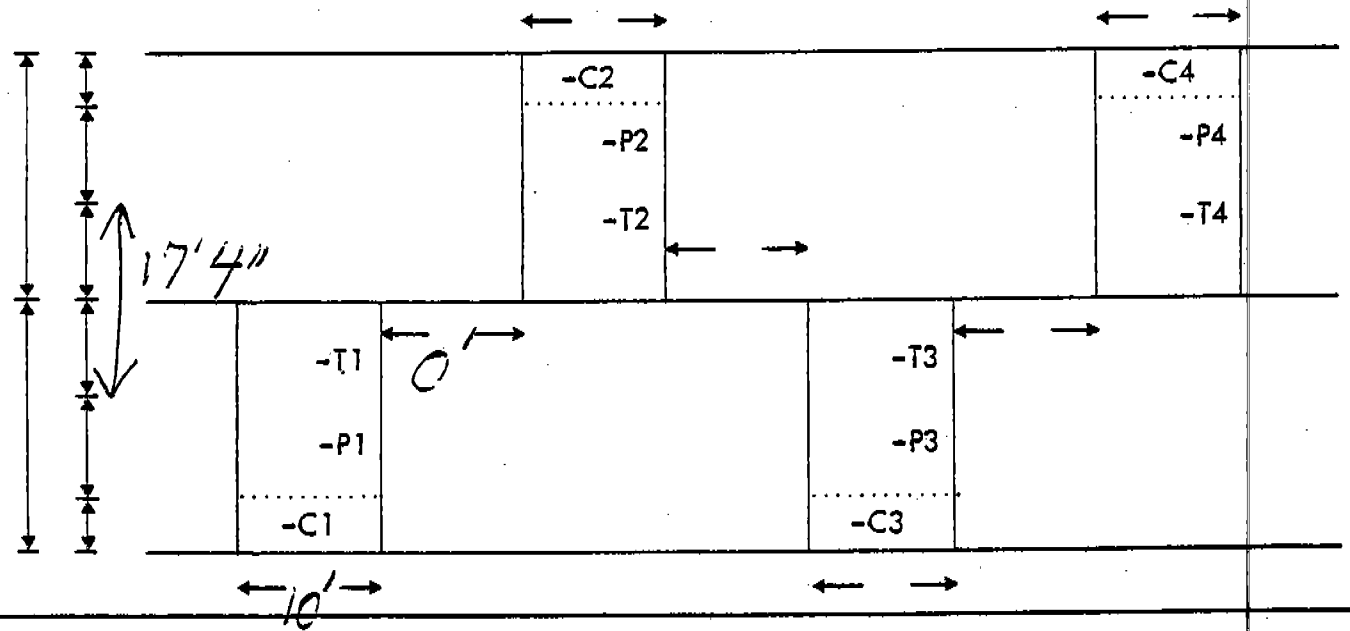
Indicate deviations from above method: Vehicle Speed ~ 15 mph

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
27	87	9:30	17'4" x	
	88		10'	

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332-1

Recorded by CRH

Material: Roadway Dust - Republic steel [a] Sample No: 27

Total Sample Weight: 979.5
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 1103A	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	

[a] Sample was split 1 time before sieving

SIZE DISTRIBUTION

Screen	Tare Weight (Screen) (g)	Final Weight (Screen + Sample) (g)	Net Weight (Sample) (g)	%
3/8 in.	551.7	561.9	10.2	2.1
4 mesh	535.8	553.1	17.3	3.6
10 mesh	470.4	527.7	57.3	11.9
20 mesh	440.0	559.6	119.6	24.9
40 mesh	396.7	514.7	118.0	24.6
100 mesh	354.2	443.9	89.7	18.7
140 mesh	356.3	395.7	39.4	8.2
200 mesh	346.2	365.8	19.6	4.1
Pan	372.9	381.9	9.0	1.9

Net Weight <20 mesh: 275.7g (57.4%) 480.1
Net Weight <200 mesh: 9.0g

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X ~~100 = _____~~ X 100 = 1.9 %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-L-1

Sampling Data
Paved Roads

Date 11/9/78
Recorded by _____

Type of Material Sampled: Roadway Dust - Republic
Site of Sampling: Access Road to Blast Tonnage Area
Type of Pavement: Asphalt Surface Condition Smooth

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

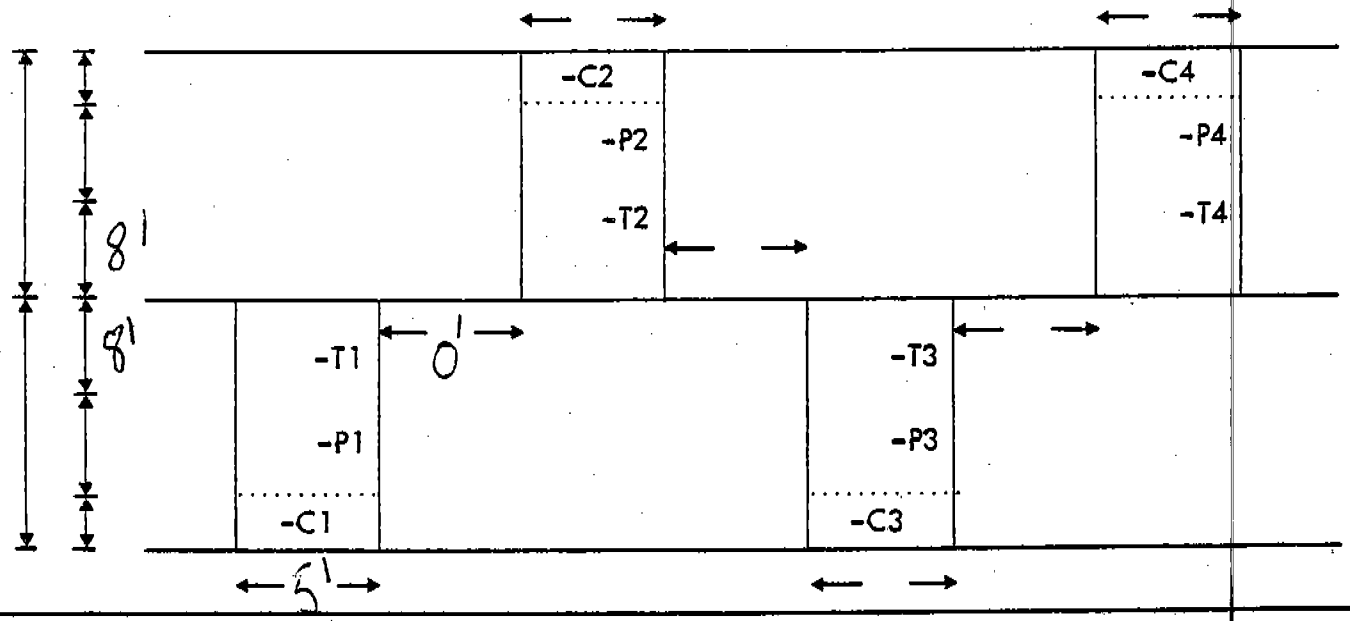
Indicate deviations from above method: Vehicle Speed ~ 10-15 mph

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
28	89	10:00	16' x 5'	
	90			
		Hand Sweeping		16 lbs.

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332L-1

Recorded by RCS

Material: Roadway Dust

Sample No: 28

Total Sample Weight: 16 lbs. Hand Sweepings
(Excl. Container)
Number of Splits: 4 (Hand Sweepings Only)

Oven Temperature ______
Date In 11/9/78 Date Out ______
Time In 17:00 Time Out ______
Drying Time ______
Split Sample Balance:
Make ______
Capacity ______
Smallest Division ______

Split Sample Weight (before drying) (Hand sweepings)
Pan + Sample: 425.3
Pan: 14.0
Wet Sample: 411.3

Material Weight (after drying)
Pan + Material: 422.6
Pan: 14.0
Dry Sample: 408.6

MOISTURE CONTENT:
(A) Wet Sample Wt. 411.3
(B) Dry Sample Wt. 408.6
(C) Difference Wt. 2.7

$\frac{C \times 100}{A}$ = 0.7 % Moisture

Sieving

Time: Start:	Weight (Pan Only)
Initial (Tare): 14:52	
20 min:	
30 min:	
40 min:	

~~a vac. bag sample added, weight after addition was ____~~ this was split 2 times

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.7	551.9	0.2	
4 mesh	536.0	538.6	2.6	
10 mesh	470.7	484.8	14.1	
20 mesh	440.0	467.7	27.7	
40 mesh	397.0	435.6	38.6	
100 mesh	354.4	484.2	129.8	
140 mesh	356.5	453.9	97.4	
200 mesh	346.5	426.4	79.9	
Pan	372.8	377.3	4.5	

Net Weight <20 mesh: 350.2 394.8
Net Weight <200 mesh: 4.5

% Silts = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 1.14 X 100 = ____ %

*Indicate Units with all Weights

4/78

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-41

Sampling Data
Storage Piles

Date 11/9/78
Recorded by GRY

Type of Material Sampled: PELLETS
Site of Sampling: ~~REPUBLIC~~ STEEL - Pellet Pile 100' S of Blast Furnace Office

SAMPLING METHOD

1. Sampling device: pointed shovel
2. Sampling depth: 4 - 6 inches
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every pile sampled
   (b) composite of 10 increments
5. Minimum portion of stored material (at one site) to be sampled: 25%

Indicate deviations from above method: _____

SAMPLING DATA

Sample No.	Time	Location (Refer to map)	Surface Area	Depth	Quantity of Sample
29	1040A			5"	65#

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-4

Recorded by CRH

Material: PELLETS

Sample No: 29

Total Sample Weight: 65 #
(Excl. Container)
Number of Splits: _____

Oven Temperature 110 C
Date In 11/9/78 Date Out _____
Time In 17:00 Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

Split Sample Weight (before drying)
Pan + Sample: 1024.4
Pan: 13.9
Wet Sample: 1010.5

Material Weight (after drying)
Pan + Material: 1015.7
Pan: 13.9
Dry Sample: 1001.8

MOISTURE CONTENT:
(A) Wet Sample Wt. 1010.5
(B) Dry Sample Wt. 1001.8
(C) Difference Wt. 8.7

$\frac{C \times 100}{A}$ = 0.9 % Moisture

Sieving

Time: Start: 8945	Weight (Pan Only)
Initial (Tare): 13.9	
20 min:	
30 min:	
40 min:	
10:25	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.1	1405.1	852.0	
4 mesh	534.8	642.2	107.4	
10 mesh	468.2	471.8	3.6	
20 mesh	420.3	421.3	1.0	
40 mesh	400.0	401.2	1.2	
100 mesh	357.2	358.6	1.4	
140 mesh	352.6	356.9	4.3	
200 mesh	349.4	351.1	1.7	
Pan	374.4	404.4	30	

Net Weight <20 mesh: 38.6 1002.6
Net Weight <200 mesh: 30

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = ~~3.82.99~~ X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332-L

Sampling Data
Unpaved Roads

Date 11/9/78
Recorded by

Type of Material Sampled: Unpaved Rd. Slag Cover
Site of Sampling: 100 yards west of entering Kelly

SAMPLING METHOD

1. Sampling device: whisk broom and dust pan
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every 10 miles sampled
   (b) composite of 4 increments: lateral strips of 6" width extending over traveled portion of roadway half

Indicate deviations from above method: _____

SAMPLING DATA

Sample No.	Time	Location	Surface Area	Depth	Quantity of Sample
30	11:00	Rep. Slag Haul	11' x 10"	1/4"	
		(Hebket Eng.)	13'6" x 10"	1/4"	

DIAGRAM

IN OVEN

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332-1

Recorded by _____

Material: Unpaved Road - Slag Cover

Sample No: 30

Total Sample Weight: 30 lbs
(Excl. Container)
Number of Splits: 4

Oven Temperature _____
Date In _____ Date Out 11/13
Time In ~~1443~~ Time Out 3:20
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

Split Sample Weight (before drying)
Pan + Sample: 741.7
Pan: 13.9
Wet Sample: 727.5

Material Weight (after drying)
Pan + Material: 726.1
Pan: 13.9
Dry Sample: 712.2

MOISTURE CONTENT:
(A) Wet Sample Wt. 727.5
(B) Dry Sample Wt. 712.2
(C) Difference Wt. 15.3

$\frac{C \times 100}{A}$ = 2.1 % Moisture

Sieving

Time: Start: 8:24	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.3	607.0	53.7	
4 mesh	534.8	695.2	160.4	
10 mesh	468.3	639.6	171.3 ~~160.9~~	
20 mesh	420.6	509.3	88.7	
40 mesh	400.1	454.2	54.1	
100 mesh	357.2	433.1	75.9	
140 mesh	352.8	379.7	26.9	
200 mesh	349.6	381.2	31.6	
Pan	374.5	425.3	50.8	

Net Weight <20 mesh: 239.3 239.3 713.4
Net Weight <200 mesh: 50.8

% Silt: = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 7.12 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332L-1

Sampling Data
Paved Roads

Date 11/9/78
Recorded by RB

Type of Material Sampled: Paved Road Dust
Site of Sampling: 26th ST. Across from Goodyear
Type of Pavement: Asphalt Surface Condition Smooth

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

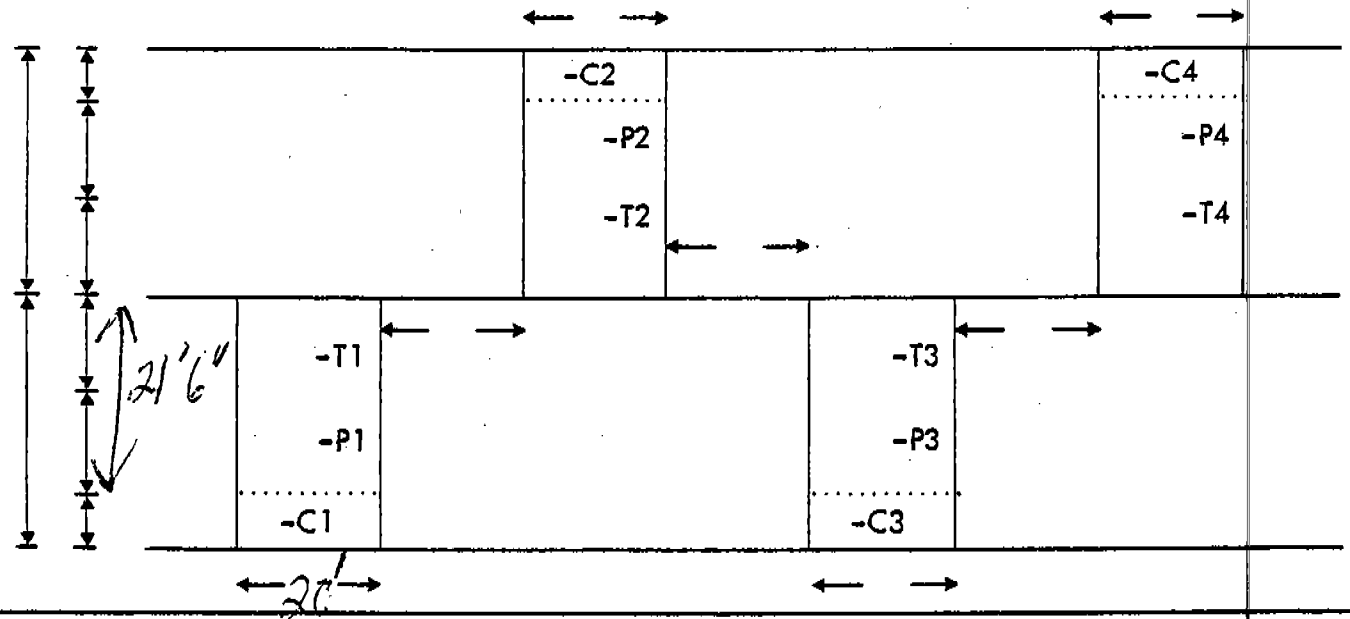
Indicate deviations from above method: _____

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
31	91	14:00	21'6"	
	92		x 2C'	

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332.4

Recorded by _____

Material: Paved Road Dust

Sample No: 31

Total Sample Weight: 127.1
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 1423	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 1512	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.5	555.0	1.5	
4 mesh	535.1	558.6	23.5	
10 mesh	468.3	485.2	16.9	
20 mesh	420.5	432.2	11.7	
40 mesh	400.3	408.0	7.7	
100 mesh	357.4	366.9	9.5	
140 mesh	352.8	357.5	4.7	
200 mesh	349.6	358.0	8.4	
Pan	374.6	415.9	41.3	

Net Weight <20 mesh: ~~358~~ ~~384~~ 766 125.2
Net Weight <200 mesh: 41.3

% Silt = $\frac{\text{Net Weight} < 200 \text{ Mesh}}{\text{Total Net Weight}}$ X 100 = $\frac{41.3}{125.2}$ X 100 = 32.98 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332L-1

Sampling Data
Unpaved Roads

Date 1/19/78
Recorded by RS

Type of Material Sampled: Unpaved Road Dust
Site of Sampling: Goodyear Parking Lot - Access from Hi-Vol

SAMPLING METHOD

1. Sampling device: whisk broom and dust pan
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every 10 miles sampled
   (b) composite of 4 increments: lateral strips of 6" width extending over traveled portion of roadway half

Indicate deviations from above method: _____

SAMPLING DATA

Sample No.	Time	Location	Surface Area	Depth	Quantity of Sample
32	1400		5' x 16"	surface	7 lbs

DIAGRAM

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332L-7

Recorded by RCS

Material: Unpaved Parking Lot Material Sample No: 32

Total Sample Weight: 9 lbs.
(Excl. Container)
Number of Splits: _____

Oven Temperature 110 C
Date In 11/9/75 Date Out _____
Time In 17:00 Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

Split Sample Weight (before drying)
Pan + Sample: 511.2
Pan: 140
Wet Sample: 371.2

Material Weight (after drying)
Pan + Material: 427.9
Pan: 354.0
Dry Sample: 373.9

MOISTURE CONTENT:
(A) Wet Sample Wt. 371.2
(B) Dry Sample Wt. 373.9
(C) Difference Wt. 3.3

$\frac{C \times 100}{A}$ = 0.4 % Moisture

Sieving

Time: Start: 1207	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 1247	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.9	1039.9	488.0	
4 mesh	536.1	673.0	136.9	
10 mesh	471.1	535.1	64.0	
20 mesh	440.0	476.1	36.1	
40 mesh	396.8	419.8	23.0	
100 mesh	354.3	376.1	21.8	
140 mesh	356.4	368.2	11.8	
200 mesh	346.5	365.6	19.1	
Pan	372.9	446.5	73.6	

Net Weight <20 mesh: [illegible] 149.3 g [illegible] 874.3 g
Net Weight <200 mesh: 73.6 g

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = [illegible] / 8.42 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332 L-1

Sampling Data
Paved Roads

Date 11/9/78
Recorded by

Type of Material Sampled: Roadway Dust
Site of Sampling: Circled Between 6th + 6-2nd Cby CAM Station
Type of Pavement: Asphalt Surface Condition Smooth

SAMPLING METHOD

1. Sampling device: Portable vacuum cleaner (broom sweep first if loading is heavy)
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample for significant road segment with given surface characteristics - not to exceed 100 miles
   (b) composite of 4 increments: lateral strips of 1 ft. minimum width extending over traveled portion of roadway half

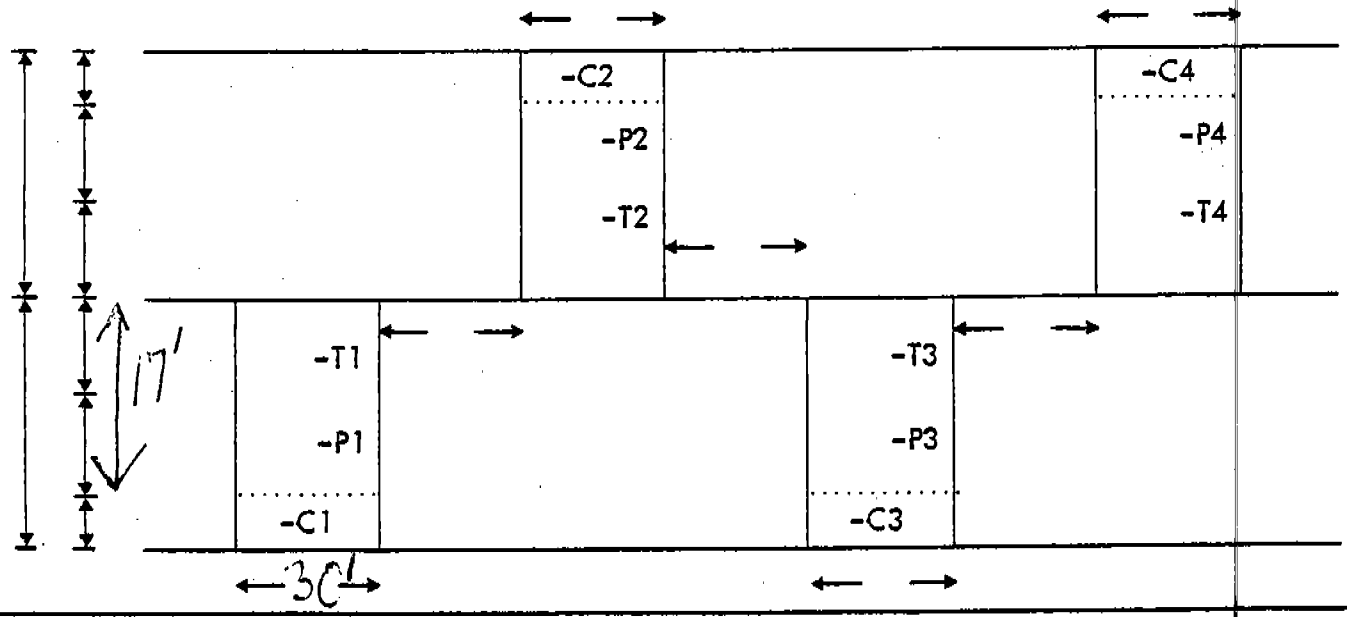
Indicate deviations from above method:

SAMPLING DATA

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample
33	93	14:30		
	94		17'x3'	

Sample No.	Vac Bag	Time	Surface Area	Quantity of Sample

DIAGRAM



MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4532L-1

Recorded by RB

Material: Paved Road Dust

Sample No: 3.3

Total Sample Weight: 122.2
(Excl. Container)
Number of Splits: _____

Oven Temperature _____
Date In _____ Date Out _____
Time In _____ Time Out _____
Drying Time _____
Split-Sample Balance:
Make _____
Capacity _____
Smallest Division _____

MOISTURE CONTENT:
(A) Wet Sample Wt. _____
(B) Dry Sample Wt. _____
(C) Difference Wt. _____

$\frac{C \times 100}{A}$ = _____ % Moisture

Split Sample Weight (before drying)
Pan + Sample: _____
Pan: _____
Wet Sample: _____

Material Weight (after drying)
Pan + Material: _____
Pan: _____
Dry Sample: _____

Sieving

Time: Start: 13:29	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
14:11	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.7	553.4	1.7	
4 mesh	535.8	551.8	16.0	
10 mesh	470.7	488.6	17.9	
20 mesh	440.0	455.3	15.3	
40 mesh	397.0	412.4	15.4	
100 mesh	354.5	370.4	15.9	
140 mesh	356.5	361.3	4.8	
200 mesh	346.6	354.7	8.1	
Pan	372.8	398.8	26.0	

Net Weight <20 mesh: 70.2 121.1
Net Weight <200 mesh: 26.0

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 21.4 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332 L-1

Sampling Data
Unpaved Roads

Date 11/9/78
Recorded by RB

Type of Material Sampled: Unpaved Parking Lot
Site of Sampling: 56th & Buffalo, Yoder Uncle Cr. + e

SAMPLING METHOD

1. Sampling device: whisk broom and dust pan
2. Sampling depth: loose surface material
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every 10 miles sampled
   (b) composite of 4 increments: lateral strips of 6" width extending over traveled portion of roadway half

Indicate deviations from above method: _____

SAMPLING DATA

Sample No.	Time	Location	Surface Area	Depth	Quantity of Sample
34	1500		~~10' x~~		
			5' x 10'	1/4"	5 32 lbs.
			5' x 10'	1/4"	2

DIAGRAM

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No.
MRI Project No. 4332-1

Recorded by RB

Material: Unpaved Parking Lot

Sample No: 34

Total Sample Weight: 32 lbs.
(Excl. Container)
Number of Splits: 4

Oven Temperature 110 C
Date In 11/9/78 Date Out
Time In 17:00 Time Out
Drying Time
Split Sample Balance:
Make
Capacity
Smallest Division

Split Sample Weight (before drying)
Pan + Sample: ~~1048~~ 1001.8
Pan: 13.9
Wet Sample: 987.9

Material Weight (after drying)
Pan + Material: 991.0
Pan: 13.9
Dry Sample: 977.1

MOISTURE CONTENT:
(A) Wet Sample Wt. 987.9
(B) Dry Sample Wt. 977.1
(C) Difference Wt. 10.8

$\frac{C \times 100}{A}$ = 1.1 % Moisture

Sieving

Time: Start: 1513	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 1553	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	552.0	1078.5	526.5	
4 mesh	536.0	610.0	74.0	
10 mesh	470.4	557.4	87.0	
20 mesh	440.0	493.1	53.1	
40 mesh	397.0	434.4	37.4	
100 mesh	354.4	413.5	59.1	
140 mesh	356.5	384.3	27.8	
200 mesh	346.6	379.0	32.4	
Pan	372.8	453.1	80.3	

Net Weight <20 mesh: 237
Net Weight <200 mesh: 80.3

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ $\frac{80.3}{977.6}$ X 100 = 8.21 X 100 = ____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. _____

Sampling Data
Storage Piles

Date 11-13-78
Recorded by RCS

Type of Material Sampled: Pellets - Wabash
Site of Sampling: Bethlehem - bay canal + Blast furnaces - North end of Pile (on top)

SAMPLING METHOD

1. Sampling device: pointed shovel
2. Sampling depth: 4 - 6 inches
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every pile sampled
   (b) composite of 10 increments
5. Minimum portion of stored material (at one site) to be sampled: 25%

Indicate deviations from above method: _____

SAMPLING DATA 5 splits

Sample No.	Time	Location (Refer to map)	Surface Area	Depth	Quantity of Sample
~~110~~ 35	1050			≈ 3"	83

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 433211

Recorded by fh

Material: IRON Ore Pellets

Sample No: 35

Total Sample Weight: 83
(Excl. Container)
Number of Splits: 5

Oven Temperature 110°C
Date In 11/13 Date Out _____
Time In 3:05 Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

Split Sample Weight (before drying)
Pan + Sample: 1235.1 g
Pan: 13.9
Wet Sample: 1221.2 g

Material Weight (after drying)
Pan + Material: 1211.0
Pan: 13.9
Dry Sample: 1197.1

MOISTURE CONTENT:
(A) Wet Sample Wt. 1221.2
(B) Dry Sample Wt. 1197.1
(C) Difference Wt. 24.1

$\frac{C \times 100}{A}$ = 1.97 % Moisture

Sieving

Time: Start: 1025	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
11:05	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.8	1346.5	794.7	
4 mesh	535.9	795.5	259.6	
10 mesh	470.8	503.6	32.8	
20 mesh	440.1	448.6	8.5	
40 mesh	397.1	400.4	3.3	
100 mesh	354.4	359.0	4.6	
140 mesh	356.5	368.5	12.0	
200 mesh	346.5	356.1	9.6	
Pan	372.8	443.5	70.7	

Net Weight <20 mesh: 100.2 ~~1195.8~~ 1195.8
Net Weight <200 mesh: 70.7

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 5.9 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. _____

Sampling Data
Storage Piles

Date 11-13-78
Recorded by RCS

Type of Material Sampled: Knob Ore
Site of Sampling: North end of storage pile by canal / blast furn

SAMPLING METHOD

1. Sampling device: pointed shovel
2. Sampling depth: 4 - 6 inches
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every pile sampled
   (b) composite of 10 increments
5. Minimum portion of stored material (at one site) to be sampled: 25%

Indicate deviations from above method: _____

SAMPLING DATA 5 splits

Sample No.	Time	Location (Refer to map)	Surface Area	Depth	Quantity of Sample
36	1110			~ 3"	47

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332 LI

Recorded by [illegible]

Material: Iron Ore (Knob ore)

Sample No: 36

Total Sample Weight: 47 lbs
(Excl. Container)
Number of Splits: 5

Oven Temperature 105
Date In 11/13/78 Date Out _____
Time In 3:15 Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

Split Sample Weight (before drying)
Pan + Sample: 604.0
Pan: 13.9
Wet Sample: 590.1

Material Weight (after drying)
Pan + Material: 562.6
Pan: 13.9
Dry Sample: 548.7

MOISTURE CONTENT:
(A) Wet Sample Wt. 590.1
(B) Dry Sample Wt. 548.7
(C) Difference Wt. 41.4

$\frac{C \times 100}{A}$ = 7.02 % Moisture

Sieving

Time: Start: 8:04	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	551.7	620.6	68.9	
4 mesh	536.2	640.8	104.6	
10 mesh	470.6	549.1	78.5	
20 mesh	440.2	501.7	61.5	
40 mesh	396.9	460.9	64.0	
100 mesh	354.4	447.0	92.6	
140 mesh	356.3	388.4	32.1	
200 mesh	346.4	363.3	16.9	
Pan	372.8	403.9	31.1	

Net Weight <20 mesh: 236.7 g 550.2
Net Weight <200 mesh: 31.1 g

% Silt: = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 5.65 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. 4332 L1

Sampling Data
Storage Piles

Date 11/13/78
Recorded by [illegible]

Type of Material Sampled: COAL Pile
Site of Sampling: R.J. Bilham NORTH COAL PILE

SAMPLING METHOD

1. Sampling device: pointed shovel
2. Sampling depth: 4 - 6 inches
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every pile sampled
   (b) composite of 10 increments
5. Minimum portion of stored material (at one site) to be sampled: 25%

Indicate deviations from above method: _____

SAMPLING DATA 5 SPLITS

Sample No.	Time	Location (Refer to map)	Surface Area	Depth	Quantity of Sample
4332 37	11:30			4"	26 lb.

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Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332L1

Recorded by fh

Material: COAL

Sample No: ~~35~~ 37

Total Sample Weight: 26 lbs.
(Excl. Container)
Number of Splits: 5

Oven Temperature 105
Date In 3:17 Date Out _____
Time In 11/13/78 Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

Split Sample Weight (before drying)
Pan + Sample: 273.5
Pan: 14.0
Wet Sample: 259.5

Material Weight (after drying)
Pan + Material: 265.0
Pan: 14.0
Dry Sample: 251.0

MOISTURE CONTENT:
(A) Wet Sample Wt. 259.5
(B) Dry Sample Wt. 251.0
(C) Difference Wt. 8.5

$\frac{C \times 100}{A}$ = 3.28 % Moisture

Sieving

Time: Start: 16:15	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 16:55	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	~~552.0~~	635.7	~~83.7~~	
4 mesh	536.1	587.8	51.7	
10 mesh	470.5	513.8	43.3	
20 mesh	440.2	465.7	25.5	
40 mesh	397.1	412.9	15.8	
100 mesh	354.1	369.8	15.7	
140 mesh	356.5	360.1	3.6	
200 mesh	346.4	350.4	4.0	
Pan	372.8	382.5	9.7	

Net Weight <20 mesh: 48.8 — 253.0
Net Weight <200 mesh: 9.7

% Silt: = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = ~~3.8~~ / 3.83 X 100 = _____ %

*Indicate Units with all Weights

MIDWEST RESEARCH INSTITUTE

MRI Project No. _____

Sampling Data
Storage Piles

Date 11-13-78
Recorded by RCS

Type of Material Sampled: Coke Breeze - Donna Hanna
Site of Sampling: South end By R.R. tracks (Southwest corner

SAMPLING METHOD

1. Sampling device: pointed shovel
2. Sampling depth: 4 - 6 inches
3. Sample container: metal or plastic bucket with sealed poly liner
4. Gross sample specifications:
   (a) 1 sample of 50 lb minimum for every pile sampled
   (b) composite of 10 increments
5. Minimum portion of stored material (at one site) to be sampled: 25%

Indicate deviations from above method: _____

SAMPLING DATA 5 splits

Sample No.	Time	Location (Refer to map)	Surface Area	Depth	Quantity of Sample
~~KB~~ 38	1215			~3"	19 lb

MIDWEST RESEARCH INSTITUTE

Silt and Moisture Analysis*

Run No. _____
MRI Project No. 4332-L

Recorded by fh

Material: Coke Breeze

Sample No: ~~43~~ 38

Total Sample Weight: 19 lbs.
(Excl. Container)
Number of Splits: 5

Oven Temperature 105
Date In 11/13 Date Out _____
Time In 3:20 Time Out _____
Drying Time _____
Split Sample Balance:
Make _____
Capacity _____
Smallest Division _____

Split Sample Weight (before drying)
Pan + Sample: 239.5
Pan: ~~140~~ 13.6
Wet Sample: 225.9

Material Weight (after drying)
Pan + Material: 225.0
Pan: 13.6
Dry Sample: 211.4

MOISTURE CONTENT:
(A) Wet Sample Wt. 225.9
(B) Dry Sample Wt. 211.4
(C) Difference Wt. 14.5

$\frac{C \times 100}{A}$ = 6.4 % Moisture

Sieving

Time: Start: 1448	Weight (Pan Only)
Initial (Tare):	
20 min:	
30 min:	
40 min:	
Stop 1528	

SIZE DISTRIBUTION

Screen	Tare Weight (Screen)	Final Weight (Screen + Sample)	Net Weight (Sample)	%
3/8 in.	553.1	556.5	3.4	
4 mesh	534.9	564.2	29.3	
10 mesh	468.2	534.4	66.2	
20 mesh	420.3	463.2	42.9	
40 mesh	400.4	426.5	26.1	
100 mesh	357.2	379.8	22.6	
140 mesh	352.6	357.7	5.1	
200 mesh	349.4	354.0	4.6	
Pan	374.7	386.1	11.4	

Net Weight <20 mesh: 69.8 211.6
Net Weight <200 mesh: 11.4

% Silt = $\frac{\text{Net Weight <200 Mesh}}{\text{Total Net Weight}}$ X 100 = 5.39 X 100 = _____ %

*Indicate Units with all Weights